EXHIBIT F

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA

RICHARD KADREY, an individual, et al. v. META PLATFORMS, INC., a Delaware corporation; Defendant.	Case No. 3:23-cv-03417-VC

SECOND REBUTTAL EXPERT REPORT OF BARBARA FREDERIKSEN-CROSS (TO THE "REBUTTAL REPORT OF DAVID R. CHOFFNES, PH.D., FEBRUARY 26, 2025")

Signed in Hubbard, Oregon on April 1, 2025

Barbara A. Frederiksen-Cross

Barbara Frederiksen-Cross

Table of Contents

I. ASSIGNMENT

1. I have been engaged by Meta Platforms, Inc. ("Meta") as a technical expert to provide my opinion regarding certain aspects of the downloading of certain datasets used in the development or training of large language models ("LLMs"), in particular the use of BitTorrent to download certain datasets. I submitted a rebuttal expert report in this matter on February 10, 2025 ("**Rebuttal Report**"), in response to an opening expert report of Jonathan Krein, Ph.D., served on January 10, 2025. My Rebuttal Report addressed allegations by Dr. Krein and Plaintiffs that Meta, during the download of certain datasets via BitTorrent, distributed Plaintiffs' works to third parties by "seeding" those works, which refers to when a computer on the BitTorrent network is able to upload pieces of a torrented file after its own download has completed.[1] I further explained why, for various reasons that I summarize again below, it was highly unlikely that Meta seeded Plaintiffs' works. The Krein report did not articulate any other theory beyond "seeding" by which Meta allegedly uploaded Plaintiffs' works in connection with Meta's dataset download process.

2. On February 26, 2025, Plaintiffs served a "Rebuttal Report of David R. Choffnes, Ph.D." ("**Choffnes Report**"), styled as a rebuttal to my Rebuttal Report. The Choffnes Report argues that, separate from "seeding," Meta likely uploaded at least one piece of Plaintiffs' works to another peer during the "leeching" phase, which refers to the time period during which a computer has not yet fully downloaded a torrent file.[2] Because this theory was not articulated in the Krein report, I had not had an opportunity to address allegations of leeching, let alone the specific analysis and opinions set forth in the Choffnes Report.

3. I accordingly served a "Declaration of Barbara Frederiksen-Cross in Support of Meta's Opposition to Plaintiffs' Motion for Partial Summary Judgment," dated March 24, 2025 (Dkt. 492) ("**SJ Declaration**"). I also understand that the Court has authorized service of a rebuttal report by Meta to the Choffnes Report, by April 1, 2024. I provide that report here, which was derived in part from and expands on the analysis in my SJ Declaration and explains why, in

[1] Frederiksen-Cross Rebuttal Report, ¶¶ 51, 66-67, 89-90.

[2] Choffnes Report, ¶19.

my opinion, it is unlikely that Meta shared any of the Plaintiffs' works during the leeching or seeding phases of downloading data through the BitTorrent protocol, that took place during the March to July 2024 timeframe. I also understand that, on March 28, 2025, Dr. Choffnes provided deposition testimony relating to this, and I have reviewed the transcript of that deposition ("**Choffnes Depo**.").

II. QUALIFICATIONS

4. I am the Director of Litigation Services for JurisLogic, LLC ("JurisLogic"), an Oregon corporation that provides consulting services to computer hardware and software manufacturers and computer-related technical assistance to the legal profession in the United States, Canada, Japan, China, Europe, and the UAE. My experience includes software design, programming, project management, capacity planning, performance tuning, problem diagnosis, and administration of hardware, operating systems, application software, and database management systems. I have more than fifty (50) years of experience as a software developer and consultant, including the analysis of computer-based data, software development of web-based systems, and software development for secure online data systems used by banks, insurance companies, hospitals, and telecommunication providers.

5. I have experience in the design, development, and analysis of computer software, and I have previously provided both trial and deposition testimony as an expert for matters in federal and state courts, authored a number of papers, and delivered lectures on technology to the legal profession. I also have substantial prior experience with the analysis of peer-to-peer ("P2P") file distribution networks, including both the analysis of BitTorrent-related source code and testing related to BitTorrent's operation. This experience includes tests in which I created torrent files, used BitTorrent to upload and download files, used BitTorrent to transfer files over computer networks, and captured and analyzed BitTorrent network traffic. I have also studied both publicly available BitTorrent source code (including libtorrent and other implementations), as well as source code for proprietary file distribution software that uses the BitTorrent protocol, and proprietary systems used to monitor BitTorrent activity.

6. My background and experience also include the design, implementation, and ongoing administration of databases and multi-dimensional data aggregation systems, including data extraction, transfer, and load operations used for data analysis platforms. My experience also includes programming for embedded and robotic systems. I also have experience with computer and network capacity management, storage management, and disaster recovery planning and testing.

7. I have previously qualified as an expert in federal and state courts to testify about the operation of computer software and computer systems, including for matters that involve software development disputes, failed software systems, and patent, copyright and trade secret disputes. I have also previously testified as an expert in several litigation matters that involved BitTorrent technologies. My work in these other matters included analysis and testimony relating to systems that monitor P2P file distribution systems and send notices to Internet Service Providers ("ISPs") based on the activity they detect.

8. I am a member of the Institute of Electrical and Electronics Engineers ("IEEE") and the Association for Computing Machinery ("ACM"). I am a salaried employee and one of the principals of JurisLogic. JurisLogic is compensated at the rate of $595 an hour for my work in this case. My compensation does not in any way depend on the substance of my opinions or the outcome of this or any other case.

9. If called upon to testify at trial, I may present oral testimony and/or tutorials about the operation of BitTorrent, the evidence I analyzed, my analysis processes, and the opinions I formed based on my analysis.

10. In addition, I understand that I may testify regarding my opinions on related matters, including those raised at trial by Plaintiffs' attorneys and experts, or the Court, concerning these issues. I reserve the right to supplement my report in the event that new facts become known to me before trial that impact my opinions or the bases therefor and to respond to responses to my opinions. I am aware of the continuing obligation to supplement my report under Rule 26 of the Federal Rules of Civil Procedure.

III. SUMMARY OF OPINIONS

11. In my previous Rebuttal Report, I outlined the various factors that need to align in order for any of the Plaintiffs' works to be seeded to peers (third parties) after the completion of the download, on the basis of which it remains my opinion that it is highly unlikely that Meta shared any of the Plaintiffs' works to peers during the seeding phase (after completion of the download of the torrent payload). Furthermore, in **Section V** below, I outline the factors that must all occur for Meta to have shared any of the Plaintiffs' works during the leeching phase.[3]

12. In order to share any pieces pertaining to the Plaintiffs' works to peers during the ***leeching*** phase, all of the following factors must be met: (i) Meta must have previously and affirmatively initiated a connection with a peer, (ii) Meta must have already downloaded the pieces containing the Plaintiffs' works and made them available to share, (iii) the receiving peer must not have already downloaded the pieces containing Plaintiffs' works and must also be prioritizing those pieces for download, (iv) the pieces being prioritized must contain the portion of data comprising a Plaintiff's work among all the other data in the dataset, (v) out of all the peers the receiving peer is connected to that also have the piece, Meta must have been the one chosen as the source for uploading the data, (vi) the receiving peer must have provided sufficient prior upload to Meta to be considered for an unchoke slot, and (vii) Meta must have shared all the blocks pertaining to the pieces that comprise the Plaintiffs' works. Additionally, as I will explain below, Meta only uploaded no more than approximately 30% of the data it downloaded during the torrent download process between March and July of 2024. As an additional condition, therefore, (viii) pieces pertaining to the Plaintiffs' works must have been within the no more than this approximately 30% of downloaded data. As I discuss in **Sections V and VI** below, the collection of these factors is rare and as a result, it is unlikely that Meta shared complete pieces comprising each of the Plaintiffs' works during the leeching phase.

13. The Choffnes Report asserts that there was a greater than 99% chance that Meta shared a piece of Plaintiffs' works with respect to ZLib and Internet Archive, relying on the "leeching" phase

before the torrent download was complete.[3] Nevertheless, he does not appear to directly address the factors outlined in my Rebuttal Report; he instead glosses over them using a number of unwarranted assumptions and mischaracterizations of how the BitTorrent protocol works, to arrive at a probability that grossly inflates the probability of distribution. Specifically, the assumptions made by the Choffnes Report are overly simplifying generalizations that do not accurately capture the interactions that peers are engaged in during the exchange of data through the BitTorrent protocol.

14. First, the Choffnes Report misapplies the Bernoulli experiment to the BitTorrent protocol. As detailed in **Section VII.A**, the underlying requirements for applying a Bernoulli experiment are not met for the BitTorrent protocol and do not apply here. As a result, the Choffnes Report presents inflated, unreliable probability estimates for Meta sharing any of the Plaintiffs' works during BitTorrent downloads.

15. Second, the Choffnes Report assumes that each opportunity to upload a piece results in the ***actual*** upload of a piece. In contrast, actual upload of a piece to the receiving peer can only take place if the recipient is also interested in the specific piece being offered. As I discuss in **Section VII.B** below, the Choffnes Report ignores this nuance when estimating the probability of sharing.

16. Third, the Choffnes Report makes certain simplifying assumptions, specifically that (i) the chance that Meta has a piece containing the Plaintiffs' work already downloaded and ready to share, is 50%, and (ii) the chance that a peer connected to Meta's libtorrent client has as piece that Meta wants is 50%. "For each peer at a given interval," according to the Choffnes Report, "there is thus a 25% chance of mutual interest in one piece (50% x 50%).[4] However, in making these assumptions, the Choffnes Report also ignores key principles underlying the BitTorrent protocol. As discussed in my Rebuttal Report and in **Section VII.C** below, the availability of

[3] The Choffnes Report also asserts that there was a 72.91% chance that Meta shared a piece of the Plaintiffs' works with respect to the LibGen Non-Fiction library, which I also address in this report.

[4] Choffnes Report, ¶21.

pieces within a swarm is determined dynamically and can be received in any order. Any estimation of the chance that Meta had the piece available to share with other peers at a point in time requires consideration of additional factors and cannot be generalized to a discrete probability. Further, Dr. Choffnes' assumption that the chance of Meta unchoking the peer due to mutual interest (25%) is only speculation and ignores other considerations such as the overall number of leechers for which Meta completed a BitTorrent connection and protocol handshake, and the peer's prior upload speed to Meta.

17. Furthermore, the Choffnes Report mistakes "mutual interest" as a key factor in the unchoking decisions made by a peer. As I discuss in **Section VII.C** below, the selection of peers to unchoke is not affected solely by mutual interest but is dependent and prioritized based on the bandwidth that is provided by other peers in the network and their history of prior uploads to Meta. The libtorrent client primarily utilizes a "tit-for-tat" strategy during the leeching phase for selecting peers that would be unchoked, which is completely ignored by the Choffnes Report.

18. The Choffnes Report also makes errors on the functioning of the BitTorrent protocol. For instance, the Choffnes Report asserts that "BitTorrent peers (including Meta's) are designed to upload torrent ***pieces*** to peers."[5] However, as I discuss in my Rebuttal Report, when using libtorrent, data is exchanged in the form of sub-pieces or ***blocks***, typically of 16Kb each, which are then compiled by the recipient to form a piece, after all the constituent blocks have been received. As a result, the probability of Meta uploading a piece to a peer is in turn governed by the probability of uploading all the blocks of a piece to a peer, which as I discuss in **Section VI.B** is unlikely, given that peers can receive many blocks from multiple peers simultaneously. In fact, as noted above, an analysis of the cost and usage data relating to the Meta AWS instances used for the torrent download highlights that on average, Meta only uploaded no more than 30% of all data it downloaded, which makes it even less likely that Meta provided a piece containing a Plaintiff's work.

[5] Choffnes Report, ¶17 (emphasis added).

19. Lastly, in **Section VIII**, I address additional assertions made in the Choffnes Report. Specifically, I address the inaccurate claims that my Rebuttal Report is missing evidence and that there are inconsistencies in the reported LibGen datasets downloaded through the BitTorrent protocol by Meta.

IV. BACKGROUND ON LEECHING PHASE OF BITTORRENT PROTOCOL

20. In my Rebuttal Report, I had detailed an extensive background on the relevant technologies underlying the BitTorrent protocol. For the convenience of the reader, in this section I provide a brief description of the functions and methods within the BitTorrent protocol relevant for understanding the scope of sharing Plaintiffs' works during the leeching phase.

21. The majority of the interaction for data on the internet flows through what is commonly known as a ***client-server model***, in which (a) the client computer requests data for download and (b) a centralized server responds to the request and provides the requested data. One of the primary limitations of the client-server model is the dependency on a central server or system for delivery of required data to clients. When a significant number of clients request the same resource, the central server or system can become overloaded, causing slowdowns and failures for some clients. Another related drawback is that, because a central server or system is solely responsible for retrieving and transmitting requested data, it provides a "single point of failure" such that if it fails the data may become inaccessible to clients. Moreover, any communication within the client-server model is restricted by the bandwidth available to the central server or system. This can result in the transfer of very big files taking a large amount of time – particularly if there are many clients requesting the data – as the data must be individually transmitted by the central server or system within the limited bandwidth available to it.

22. Peer-to-peer (P2P) networks were designed to address many of these issues. They operate in a similar fashion to the client-server model but with one key difference – instead of a centralized server or system, in a P2P network each computer in the network may act as both a client and a server. Computers within a P2P network can thus operate as ***peers*** that can request specific information from other peers who possess it or can provide the required information to other peers that are specifically requesting it. This differs from the client-server

model in which only the centralized server or system holds the information that can be transmitted to connected clients. As a result, whereas the bandwidth in a client-server network is restricted by the bandwidth of the central server or system, the nodes in a P2P network act as both clients and servers, so each additional node can contribute to the total bandwidth of the network. Thus, P2P networks are inherently decentralized networks.

23. When using the BitTorrent protocol, any large file is first converted to smaller ***pieces***. In practice, when a peer using BitTorrent requests specific information (e.g. a request for the pieces of a particular file) the requests can be sent to many peers, and multiple peers that have that information and are participating in the network may respond by providing the portions of the requested file simultaneously. Since the pieces of the file may be collected concurrently from multiple nodes participating in the BitTorrent network (as opposed to a central server responding with all the relevant packets in the client-server model), the BitTorrent protocol can offer advantages with respect to both the availability of a particular file and also the overall speed and resiliency of the network. This is because unlike a client-server model, file distribution is not reliant on a single point of failure or any single bandwidth bottleneck. The entire network benefits by the number of peers that are connected on the network, as well as the number of peers that contain any specific information requested by a user.

24. In the context of BitTorrent, the term ***seeder*** is used to refer to a peer that has completed the download of a file. In contrast, the term ***leecher*** refers to a peer that has begun the download and thus may have no pieces, or only some pieces, of the complete file. The term ***swarm*** refers to the collection of seeders and leechers for a particular file or set of files. Once a leecher receives all of the pieces of the complete file(s), it possesses a complete reassembled instance of the original file(s) and is then designated a seeder.

25. A leecher can request different pieces of a file from multiple peers simultaneously in order to enhance the file's download speed by finding peers that can provide the pieces it wants. As the peers respond, the requesting leecher can download different pieces from different peers, at the same time. There are further optimizations that are conducted by the BitTorrent protocol at this stage, such as (i) breaking up of pieces into sub-pieces commonly referred to as ***blocks***,

(ii) sending multiple queued requests for blocks to the peers, as well as (iii) organizing the pieces that are prioritized for download by the leecher. The first and the second optimizations are implemented such that multiple portions of a piece (*i.e.* blocks) can be received from different peers in parallel, thereby reducing the time to download the complete piece. Once all the pieces are received, the BitTorrent client effectively consolidates all the constituent pieces into the completed payload. Once the entire payload has been successfully downloaded, the BitTorrent client also reports to a tracker component that it has completed the download so that the tracker knows that the client is now a seeder.

26. Another aspect to understanding the BitTorrent protocol is the ***choking and unchoking*** process, which allows a leecher to select the other peers on the network with whom it may exchange pieces. This enables a leecher to maximize its own download rate by selecting particular peers (a default of no more than eight[6]) that will be "unchoked," *i.e.*, to whom pieces may be sent. On a technical level, this decision is made by each leecher by utilizing choking algorithms that periodically evaluate the other peers in the network. Leechers generally prioritize unchoking of other peers that will maximize their own download rate i.e., unchoking the peers that have previously provided the best upload speed to this Leecher.

27. BitTorrent provides an effective and efficient protocol for the transfer of very large files over the Internet. BitTorrent has been used by varied institutions such as universities, and governmental and non-governmental organizations. For instance, NASA utilized BitTorrent for the distribution of data related to the "visible earth" project, distributing images of Earth for researchers and enthusiasts alike. Owing to its ability to distribute large files quickly, BitTorrent has also been utilized for distribution of security patches, as well as updates to enhance gaming experience for users. For instance, Blizzard Entertainment developers of the popular game "World of Warcraft," utilized BitTorrent for the distribution of patches to the game.[7] Since its inception in the early 2000s, BitTorrent has been influential and has been

[6] Frederiksen-Cross Rebuttal Report, ¶123.

[7] Frederiksen-Cross Rebuttal Report, *e.g.*, ¶¶ 70-71.

utilized by millions of users for varied purposes including facilitating research, distribution of open-source software, and even promotion of security through distribution of software patches.

V. IT IS UNLIKELY THAT META UPLOADED PIECES CONTAINING PLAINTIFFS' WORKS DURING LEECHING

28. I previously explained in my Rebuttal Report that Plaintiffs had provided no evidence of actual distribution of any of their works, and in my opinion, it was unlikely that Meta did so via seeding. I explained that this would have been unlikely because of the numerous different practical and technical factors that would have had to have aligned in order for Meta to have seeded Plaintiffs' works to another peer on the network. In this section, I discuss additional factors that must be met in order for Meta to share any of the Plaintiffs' works during the leeching phase. Upon consideration of these factors, it is my opinion that the chance that Meta shared pieces of the Plaintiffs' works during leeching is unlikely.

29. As explained in my Rebuttal Report, after the completion of a torrent download, in order for Meta to have uploaded a piece containing the Plaintiffs' works to another peer on the network via seeding, all of the following conditions must have been met: **(i)** Meta must have previously and affirmatively initiated a connection with the receiving peer (as Meta's network firewall configuration would otherwise have blocked inbound connection requests from that peer),[8] **(ii)** the receiving peer must not have already downloaded the pieces containing Plaintiffs' works from another peer, **(iii)** the receiving peer must have been requesting one or more pieces containing Plaintiffs' works (highly unlikely given the negligible percentage of pieces in the at-issue datasets that contained Plaintiffs' works), **(iv)** the receiving peer must have selected Meta for providing that piece over all of the other available peers on the network that also had that piece, and **(v)** the peer must have remained in one of Meta's unchoke slots for long enough to download a piece containing Plaintiffs' works.[9] As previously explained, a "piece" refers to a portion of the data (payload) of a particular torrent file.

---

[8] I further discuss the holepunch extension discussed in the Choffnes Report in the sections below. *See*: Choffnes Report, ¶11.

[9] Frederiksen-Cross Rebuttal Report, *e.g.*, ¶¶ 17, 127-130, 132-134.

30. I also explained, as an additional factor relevant to seeding, that **(vi)** the peer must also have received the piece from Meta in a time window of no more than 60 seconds, because Meta's torrent download script was specifically designed to minimize seeding by disconnecting from the BitTorrent network as soon as it discovered that the download was complete, which was within no more than 60 seconds after completion of the torrent download.[10] All of these factors combine to make it highly unlikely that any piece of any Plaintiff's work was seeded by Meta. I adhere to my prior opinions regarding seeding.[11]

31. In fact, I note that the Choffnes Report does not provide any opinions about the probability of Meta having uploaded a piece of Plaintiffs' works through ***seeding***, as the probability calculations presented are based entirely on the periods of time that, he contends, Meta was still downloading/leeching.[12] Dr. Choffnes agreed at his deposition that the software used by Meta during the 2024 torrent download process disconnected the BitTorrent client from the network within no more than 60 seconds after the torrent download is complete.[13] In fact, he also admitted that his opinions about the probabilities that Meta shared a piece containing Plaintiffs' works do not take "seeding" into account at all.[14]

32. The Choffnes Report asserts that there was a greater than 99% chance that Meta shared a piece of Plaintiffs' works with respect to ZLib and Internet Archive,[15] relying primarily on the "leeching" phase before the torrent download was complete. But at the outset, I observe that Dr. Choffnes's probability opinions are limited. His analysis is based on "the probability that

---

[10] Frederiksen-Cross Rebuttal Report, *e.g.*, ¶¶ 131, 98-100.

[11] Choffnes Report ¶¶ 21-23, Table 2.

[12] Choffnes Report ¶¶ 21-23, Table 2.

[13] Choffnes Depo., 69:15-71:7.

[14] Choffnes Depo., 73:15-18 ("Q. Your probabilities, correct me if I'm wrong, do not take into account a period of time, if any, that Meta was seeding, correct? A. Correct.").

[15] The Choffnes Report also asserts that there was a 72.91% chance that Meta shared a piece of the Plaintiffs' works with respect to the LibGen Non-Fiction library, which I also address in this report.

Meta shared at least one piece of Plaintiffs' works…."[16] Dr. Choffnes clarified at his deposition what this meant – his probabilities are not tied to any particular work among the dozens works at issue in this case, as the hypothetically-shared piece "could have been from any of the Plaintiff's works."[17] He also has not provided any opinion as to the probability that Meta shared at least one piece of each of the Plaintiffs' works, or even more than one such work.[18] In my opinion, this renders Dr. Choffnes's probability estimates of questionable relevance as they do not establish a probability as to any particular copyrighted work.

33. I understand from counsel that under the copyright laws, an act of copyright infringement is based on a particular copyrighted work, and there is no probability provided with respect to any such work here. The Choffnes Report in contrast provides an abstract probability not tied to any particular work. This problem is further compounded by the fact that, as I fully explained in my Rebuttal Report, "the size of each Plaintiff work occurrence is not consistent within or across the at-issue datasets."[19] I explained that "some Plaintiff books may be disproportionately larger than other books due to factors such as embedded graphics or the automated text recognition program used for text extraction," which "may impact the proportion of each Plaintiff work within a dataset, they also impact the likelihood that a piece of the work could be seeded to other peers on the BitTorrent network."[20] My Rebuttal Report further explained that there is also inconsistency with respect to how many times Plaintiffs' works appear in the at-issue datasets; some works appear only once whereas others may be repeated dozens of times.[21] The Choffnes Report does not take these factors into account, which result in the probability that Meta shared any of Plaintiffs' works during the torrent

---

[16] Choffnes Report, ¶24.

[17] Choffnes Depo., 108:8-10; *see also* Choffnes Depo., 106:7-15 ("[...] So the probability analysis doesn't pinpoint which work was shared. It just indicates that at least one of those works was shared.").

[18] Choffnes Depo., 106:16-108:10.

[19] Frederiksen-Cross Rebuttal Report, ¶112 & Figure 5.

[20] Frederiksen-Cross Rebuttal Report, ¶112.

[21] Frederiksen-Cross Rebuttal Report, Appendix C, ¶¶ 161-162.

download process varying on a work-by-work basis (even though, in my opinion, it is unlikely that any of those works were shared during the download process).

34. As I will explain in **Section VII** below, I do not believe the Bernoulli experiment presented by Dr. Choffnes provides a reliable way to estimate the probability that Meta shared a piece containing a Plaintiff's work. Nevertheless, applying his own Bernoulli experiment analysis also results in an extraordinarily low probability that a piece of ***each*** Plaintiff work was shared. The following equation, based on the Choffnes Report, would represent the chance that at least one piece of all of the Plaintiffs' works was shared by Meta during the leeching phase:

$$U_{all} = \left(1 - (1 - p_1)^{(i_1 * s)}\right) * \left(1 - (1 - p_2)^{(i_2 * s)}\right) * \ldots * \left(1 - (1 - p_n)^{(i_n * s)}\right)$$

35. In the above equation, (i), (s), (p) have the same definition as the Choffnes Report, wherein, (i) represents the number of unchoke intervals, (s) represents the number of unchoke slots, and (p) is the percent chance of uploading Plaintiffs' works to one peer during slot, based on the same assumptions as the Choffnes Report. $(p_1, p_2, p_3 \ldots, p_n)$ all represent the percent chance of uploading a given Plaintiff's work (one book) to a peer during one unchoke slot opportunity (as defined in the Choffnes Report), for books contained within the at-issue datasets.[22] These values are calculated based on the portion of torrent files outlined in Tables 12 and 13 in my Rebuttal Report for IA and ZLib, multiplied by 25% for the chance of mutual interest as estimated in the Choffnes Report.[23]

36. Utilizing this equation from the Choffnes Report, under the same assumptions, the probability for sharing at-least one piece from all Plaintiffs' works is shown in column 2.

[22] Choffnes Report, ¶22.

[23] Choffnes Report, ¶21.

Table 1: Estimated Probabilities Based on Model in the Choffnes Report for Sharing At Least One Piece from Each of the Plaintiffs' Works Across Downloaded Datasets[24]

Dataset	Probability of sharing at least 1 piece from each of Plaintiffs' works
IA	0.00000000000000023362%
ZLib	0.000000000000000002848%

37. As shown in **Table 1 above**, even if the model presented in the Choffnes Report is correct (which, as I discuss in **Section VII,** it is not), and the underlying assumptions are taken at face value, the chance that Meta shared at least one piece from all of the Plaintiffs' works included in the at-issue datasets is next to zero. It is therefore highly unlikely, even using the model presented in the Choffnes Report that Meta shared each of Plaintiffs' works during the torrent download process.

38. The Choffnes Report also does not appear to directly address the factors outlined in my Rebuttal Report; he instead glosses over them using a number of unwarranted assumptions and mischaracterizations of how the BitTorrent protocol works, to arrive at a statistical probability model that grossly inflates the probability of distribution. Nevertheless, factors **(i)** through **(v)** outlined above with respect to seeding also apply to uploading during the leeching period. The following additional factors also apply:

39. **For uploading during leeching to have occurred, Meta must also have already downloaded the piece containing Plaintiffs' works**. Under the scenario addressed in the Krein Report to which my Rebuttal Report responded, *i.e.*, Meta was acting as an alleged seeder, Meta would have had ***all*** the pieces pertaining to that torrent file and would be available to share (for no more than 60 seconds). But when considering the leeching phase prior to completion of the download, by definition, Meta would have downloaded only ***some*** of the

[24] LibGen.rs Non-Fiction is omitted from this table as it only contains a single Plaintiff work.

pieces of the torrent, and only those pieces would have been available for potentially uploading to other peers. Once a complete piece has been downloaded and verified, the downloading peer sends a "HAVE" message to advertise the availability of the new piece to the peers for which it already has a connection[25] – only then could other peers request that piece. As discussed in my Rebuttal Report, the order in which pieces are downloaded is non-deterministic and depends on the swarm dynamics for that specific torrent file; the timing of when Meta obtained these pieces cannot be determined retroactively. If the pieces pertaining to the Plaintiffs' works were acquired towards the end of the downloading process, for example, the window to share those pieces with others would be small.

40. **For uploading during leeching to have occurred, Meta must also have unchoked the receiving peer based on "tit-for-tat" strategy**. During the *seeding* phase after the download of the entire torrent payload for a given torrent file, libtorrent uses a round-robin method of unchoking, checking the eight unchoke slots every 15 seconds, and potentially rotating out peers. But during the *leeching* phase, libtorrent uses a "tit-for-tat" strategy for unchoking peers,[26] in which peers that have most quickly provided data to Meta are prioritized for unchoking.[27] These prioritization decisions are made dynamically, based on factors that include determining which peers have so far provided the best upload speeds and mutual interest with respect to each peer's available pieces (i.e., a peer is more likely to be unchoked if it is interested in the pieces that the unchoking peer has available, and is also actively sharing pieces that the unchoking peer is interested in). But even if a peer is unchoked, there is no certainty that any data will be transmitted. For instance, a peer that has provided good upload

---

[25] In some cases, this information is transmitted among peers using a bitfield. *See*: Jules Sam Randolph, "Answer to 'How Does Bittorrent Work?,'" Super User, October 25, 2014, https://superuser.com/a/831673.

[26] "Libtorrent," libtorrent, accessed March 20, 2025, https://libtorrent.org/reference-Settings.html#choking_algorithm.

[27] Unless the peer was subject of an optimistic unchoke, which are limited for only 20% of all unchoke slots (20%) and only rotate on an interval of 30 seconds. *See*: "Libtorrent," libtorrent, accessed March 20, 2025, https://www.libtorrent.org/reference-Settings.html#settings_pack.

speed, and is given an unchoke slot, still may not request any piece at all during that unchoke cycle.

41. **For uploading during leeching to have occurred, Meta must also have uploaded sub-pieces or blocks actually containing Plaintiffs' works.** As discussed in my SJ Declaration, and further below, the data that is exchanged among peers are sub-pieces or blocks, that are compiled by the BitTorrent client to complete a piece.[28] As I discuss in **Sections VI.A** and **VI.B** below, individual blocks are unusable by peers and multiple blocks can be received by the downloading peer from many other peers simultaneously. As a result, even in the unlikely chance that a peer that had been granted an unchoke slot and requested a block or blocks that contained a portion of a Plaintiff's work, and Meta uploaded any blocks pertaining to pieces comprising of the Plaintiffs' works, it is still unlikely that Meta uploaded all the blocks that comprise that piece. Further, Meta only uploaded no more than approximately 30% of the data it downloaded during the torrent download process, as I will discuss in more detail below.

42. To summarize, all of the following factors must be met for Meta's instance to share any pieces comprising the Plaintiffs' works to other peers during the leeching phase: (i) Meta must have previously and affirmatively initiated a connection with a leecher, (ii) Meta must have already downloaded the pieces containing the Plaintiffs' works and made them available to share, (iii) the receiving peer must not have already downloaded the pieces containing Plaintiffs' works and must also be prioritizing those pieces for download, (iv) the pieces being prioritized must contain the portion of data out of all the data in the dataset that contains a given Plaintiff's works, (v) out of all the peers the receiving peer is connected to that also have the piece, Meta must have been the one chosen as the source for seeding, (vi) the receiving peer must have provided a high enough bandwidth to Meta for the download of other pieces, to be considered for an unchoke slot, and (vii) Meta must have shared all the blocks pertaining to the piece that contains the Plaintiffs' works.

[28] Frederiksen-Cross Rebuttal Report, ¶ 65.

43. Considering all of the constraints and conditions that must have been met, which are influenced by the swarm dynamics at the time of the download, in my opinion, it is unlikely that Meta uploaded the pieces containing Plaintiffs' works to other leechers during download of the at-issue dataset.

VI. THE CHOFFNES REPORT MISCHARACTERIZES THE BITTORRENT PROTOCOL

44. Another factor outlined in my Rebuttal Report and not disputed by the Choffnes Report is the small proportion of pieces in the torrent files that contain Plaintiffs' works.[29] For the ZLib dataset, for example, all the pieces containing Plaintiffs' works combined make up 0.023% of the torrent files that contain Plaintiff works (a subset of all downloaded torrent files).[30] Accordingly, if ZLib were represented as the 52 mile distance between San Jose and San Francisco, all the pieces of the Plaintiffs' works would be a little less than two bus lengths.[31] Similarly for the IA dataset, all the pieces of the Plaintiffs' works combined make up 0.056% of the torrent files that contain Plaintiff works.[32] Using the same analogy of the distance from San Jose to San Francisco, all of Plaintiffs' books in the IA dataset would stretch roughly over four bus lengths. The Choffnes Report does not dispute any of this; he admitted in his deposition that he relied "entirely" on the analysis in my earlier Rebuttal Report and did not dispute it.[33] As I previously explained, the fact that Plaintiffs' works constitute a negligible percentage of the overall payload reduces the likelihood that Meta's AWS instances ever seeded pieces containing Plaintiffs' works.[34]

---

[29] Frederiksen-Cross Rebuttal Report, ¶¶ 117-121.

[30] Frederiksen-Cross Rebuttal Report, Table 4.

[31] Frederiksen-Cross Rebuttal Report, ¶¶ 120.

[32] Frederiksen-Cross Rebuttal Report, Table 4.

[33] Choffnes Depo., 74:17-75:20.

[34] As previously explained in my Rebuttal Report, I observed more than 660 copies of the Plaintiffs' works across the three downloaded datasets; this was attributable to the fact that these datasets tend to exhibit significant amounts of duplication. For example, the ZLib dataset alone had 42 copies of Laura Lippman's What the Dead Know, and 40 copies of Jacqueline Woodson's Another Brooklyn. Frederiksen-Cross Rebuttal Report, ¶ 161, Tables 9-10.

45. The Choffnes Report's new focus on uploading during "leeching" highlights an additional problem; his report provides a probability estimate as to whether Meta uploaded ***a piece*** of Plaintiffs' works but data is ***not*** transferred among BitTorrent peers in entire pieces but in sub-pieces commonly referred to as ***blocks***. These blocks are typically 16 kilobytes (16K) in size.[35] For example, a piece four megabytes (4MB) in size would have 256 individual blocks, and a piece that is 256 MB in size would have 16,384 individual blocks. These blocks thus constitute a small fraction of the overall piece, which itself constitutes a small portion of the overall torrent payload. Critically, as I discuss in **Section VI.B** below, different blocks within a piece can be obtained from multiple peers simultaneously, thus reducing the chance that any particular block would have come from a given peer (such as Meta) as opposed to some other peer on the network.

46. The Choffnes Report does not make any mention of blocks. Nor does it provide probabilities at the block-level. At his deposition, in fact, Dr. Choffnes acknowledged that his analysis should have been conducted at the block level rather than on the basis of pieces, and noted that he would conduct such an analysis, if allowed to do so. As he explained: "So I know that in the declaration from Frederiksen-Cross, the most recent one, she mentions that ***the analysis should have been done on a block level, which I agree with***, but I did not have the statistics about the percent of blocks in Plaintiffs' work, so I used pieces, and revisiting this with blocks would be another kind of analysis that I would be happy to do if that kind of analysis were to be accepted as an amendment to this report. But given the information that I had available, which was from Frederiksen-Cross's report, I used pieces in this analysis, even though ***it would be more precisely calculated with blocks***." (emphasis added).[36] I express no opinions as to whether or not Dr. Choffnes should be allowed to provide further opinions based on a block-level analysis, but there was nothing preventing him from doing so in the Choffnes Report. This is because the calculation of the number of blocks in Plaintiffs' works is based on information that was already available to him, including the list of downloaded files provided

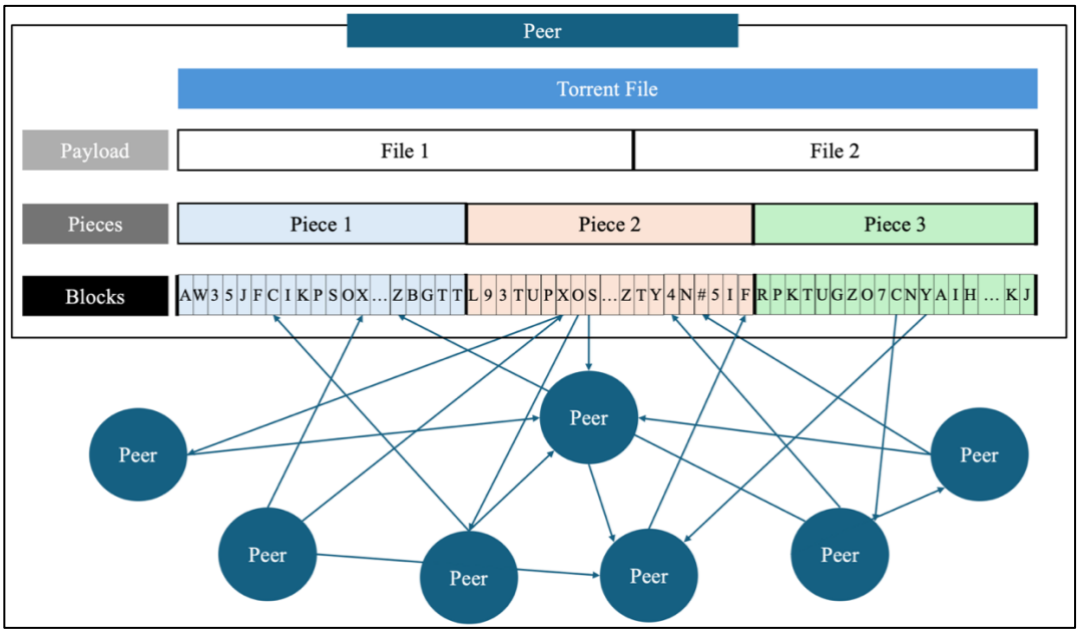
[35] Frederiksen-Cross Rebuttal Report, ¶¶ 65-66.

[36] Choffnes Depo., 103:19-104:9 (emphasis added).

with my Rebuttal Report, as well as publicly-known information such as the block size used by the BitTorrent protocol.

47. **Figure 1** below shows a highly-simplified illustrative breakdown of files into pieces, and further into blocks, which are exchanged among multiple peers.[37] As depicted in the figure below, the upload of data within the BitTorrent protocol is in fact an upload of these sub-pieces or blocks, with different blocks provided simultaneously by multiple different peers and in a non-deterministic order. The uploading peers can also include seeders who do not require blocks from any other peers (discussed further below), and as illustrated below, it is possible for the underlying files to straddle more than one piece.

Figure 1: Exchange of Blocks Among Peers in the Swarm



48. In the next section I further discuss the distribution of these blocks during the download of a torrent payload. As I discuss, unless all of the blocks have been received, reassembled, and verified, a particular piece remains unusable.

[37] The simplified illustrative highlights core concepts of the BitTorrent protocol. In practice, each piece is subdivided into hundreds of smaller blocks, and torrent swarms may include more peers.

A. Partially Received Sub-Pieces or Blocks are Not Usable

49. As I discussed in my Rebuttal Report, the BitTorrent protocol divides each piece into smaller sub-pieces or blocks of the torrent payload.[38] The exchange of data within the BitTorrent protocol is in fact an exchange of these blocks, which are compiled by the BitTorrent client to reconstruct a piece, when all the blocks for a specific piece have been downloaded. Therefore, only after all the blocks underlying all the pieces of a file have been received by a peer, can the torrent payload be compiled together to form the required file.

50. It is important to consider that the upload and download of data takes place at the block level as (i) unless all the blocks have been received, a particular piece remains unusable, and (ii) different peers can share different blocks comprising the same piece with a leecher, thereby reducing the chance that all the blocks comprising a piece are received by a leecher from the same peer. The Choffnes Report fails to consider this complexity within the BitTorrent protocol and mischaracterizes the probability of Meta's potential involvement in sharing pieces containing the Plaintiffs' works.

51. During the download process, a block of a piece containing the data is exchanged between the sending and the receiving peer. Each peer has multiple blocks queued to be requested from connected peers at a given point in time. Only after all the blocks comprising a piece have been received, are the individual blocks compiled into a piece, verified, and stored on the disk. There are two primary reasons for this: (i) the piece hash for the received piece can only be calculated so that the piece can be verified once all the blocks have been received by the receiving peer, and (ii) a piece can only be written to the disk of the receiving peer (and thus be downloaded) after it has received all the blocks and these blocks have been verified.[39,40]

---

[38] Frederiksen-Cross Rebuttal Report, ¶65.

[39] "Libtorrent Manual," accessed March 28, 2025, https://www.libtorrent.org/tuning.html#understanding-the-disk-threads.

[40] "Libtorrent/Src/Block_cache.Cpp at v1.2.19 · Arvidn/Libtorrent," GitHub, accessed March 28, 2025, https://github.com/arvidn/libtorrent/blob/v1.2.19/src/block_cache.cpp.

52. If the piece hash calculated on the blocks received by the peer does not match the piece received in the original torrent file,[41] the entire downloaded piece is considered as a "hash fail" and is discarded.[42] Therefore, any pieces received without all the blocks will necessarily produce a different hash and be considered as a hash fail and will subsequently be discarded by the BitTorrent client. As a result, partially received pieces remain unusable by peers and cannot be shared further.

53. Partially received pieces, for which all the underlying blocks have not been received, are not written to disk.[43] This means that the received blocks are retained in a temporary storage (or a buffer) until all the blocks comprising the piece are received.[44] If there are missing blocks for a given piece, such pieces are discarded and not written to disk.[45,46] In his deposition, Dr.

---

[41] "Bep_0052.Rst_post," accessed March 20, 2025, https://www.bittorrent.org/beps/bep_0052.html.

[42] BitTorrent Limited, "Help Center - What Do the Terms 'hashfails' and 'Wasted' Mean?," BitTorrent, accessed March 28, 2025, https://www.bittorrent.com/en/support/solutions/articles/29000022802-what-do-the-terms-hashfails-and-wasted-mean-.

[43] "Libtorrent Manual," accessed March 28, 2025, https://www.libtorrent.org/tuning.html#understanding-the-disk-threads.

[44] "Libtorrent Manual," accessed March 28, 2025, https://www.libtorrent.org/tuning.html#understanding-the-disk-threads.

[45] "Bep_0052.Rst_post," accessed March 20, 2025, https://www.bittorrent.org/beps/bep_0052.html.

[46] The blocks may also be written to disk, if the cache memory is full. However, these pieces still remain unusable until compiled to form a piece by the BitTorrent client. For instance, if all the blocks are not received for a PDF file, the PDF reader application may not be able to read the PDF if it is missing key components, such as the header, object definitions, etc. See: "Libtorrent Manual," accessed March 28, 2025, https://www.libtorrent.org/tuning.html#understanding-the-disk-threads, and "Resolve Damaged Document Error When Opening PDF Files," accessed March 20, 2025, https://web.archive.org/web/20240127090015/https:/helpx.adobe.com/acrobat/kb/pdf-error-1015-11001-update.html.

Choffnes acknowledged that a piece is not usable until all of its blocks are received and stored.[47]

54. The lack of utility for partially downloaded pieces is further compounded by the fact that the Plaintiffs' works in the downloaded datasets are not in "plain text" or "ASCII text," or some other format readily usable by a human being. They instead contain elements such as formatting metadata and other internal structures that must be parsed by software to present the content to the user in an understandable way. Compression presents another problem; for example, the popular EPUB format, the most prevalent format with respect to the files constituting Plaintiffs' works, uses ZIP data compression,[48] a commonly used compression algorithm for text data. ZIP decompression relies on a "dictionary" built up from previous data in the file to reconstruct the original file.

55. Accordingly, a given "block" that provides a small portion of a larger compressed file will likely be unusable by itself because the computer will not have the dictionary used for decompression that was built from the previous data in the file. With respect to PDF files, the second most prevalent format, they may also include compressed data and, if they were not subjected to character recognition, could contain little more than scanned book page images with no recognizable text strings. As a result, even if a receiving peer were hypothetically able to capture and view individual blocks that included some portion of the Plaintiffs' works, they would be little more than unusable gibberish before the other blocks constituting the file were downloaded. **Figure 2** below demonstrates the encoded format of an exemplary PDF file, in

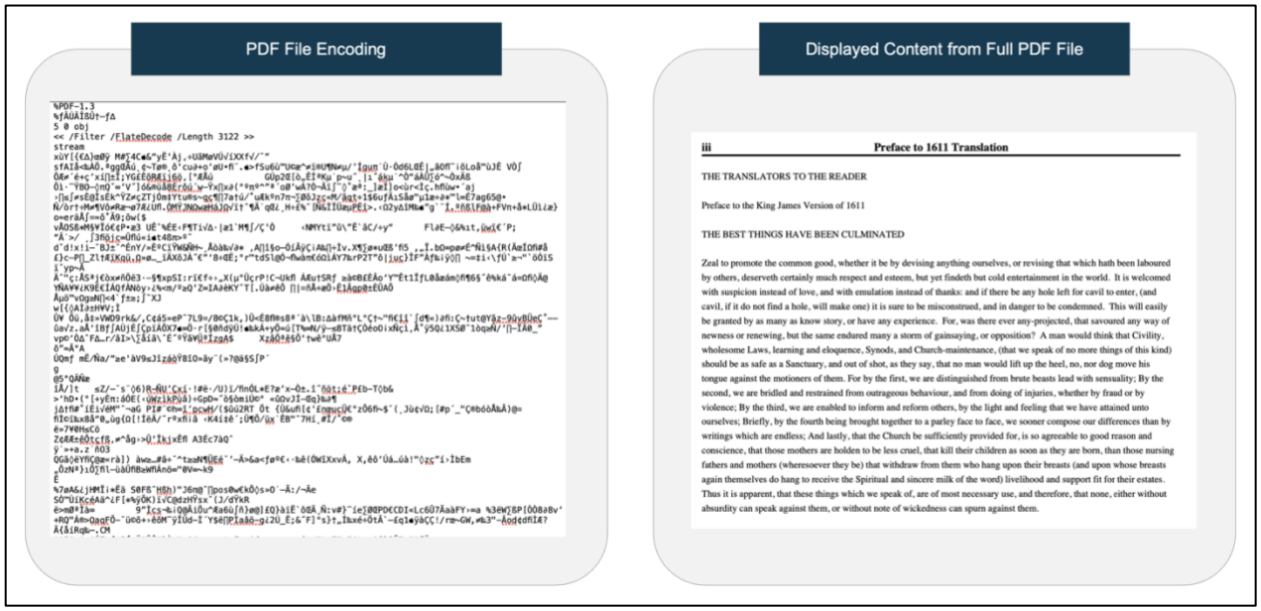
---

[47] Choffnes Depo., 119:9-20 ("Q. Once the client receives all of the blocks of the piece, what does it do at that point? A. My understanding is that piece is written to the disk or wherever you've specified the file be stored. Q. Before all the blocks of a piece had been received by a BitTorrent client, is the data usable to the user as far as you know? A. As far as I know, if it's not yet written to disk, it's not something the user can use at that moment.").

[48] "FlightDeck - Handbook - Zipping an EPUB," accessed March 21, 2025, https://ebookflightdeck.com/handbook/zipping.

contrast with the content for the same file as it would appear from the complete PDF file when displayed (which could only occur after it was fully downloaded).[49]

Figure 2: Encoded PDF File Compared to Content Displayed From Full PDF



56. The Choffnes Report does not present any probability that Meta shared any ***blocks*** pertaining to the Plaintiffs' works during the leeching phase. As explained above, Plaintiffs' works constitute a small portion of the torrented datasets. But looking at these proportions at the ***block level*** rather than the ***piece level***, the number of blocks representing Plaintiffs' works is even lower as shown in the **Table 2** below.

[49] "The King James Holy Bible," n.d., https://www.holybooks.com/wp-content/uploads/2010/05/The-Holy-Bible-King-James-Version.pdf., after removal of the cover and index pages.

Table 2: Proportion of Blocks Pertaining to Plaintiffs' Works Across Torrent Files Downloaded by Meta

Dataset	Total Number of Torrent Files Downloaded Containing Plaintiffs'' Works	Number of Blocks Pertaining to Plaintiffs' works	Total Number of Blocks Across Downloaded Torrent Files Containing Plaintiffs' Works	Proportion of Blocks within Downloaded Torrent Files Containing Plaintiffs' Works
LibGen Non-Fiction (Scitech only)	2	481	1,321,728	0.036%
Internet Archive (IA)	46	148033	4,173,447,168	0.0035%
Z-Library (ZLib)	146	33387	1,965,765,120	0.0017%

57. As a result, it is highly unlikely that *Meta* (as opposed to other peers on the network) would have shared any significant number of blocks from pieces constituting the Plaintiffs' works to any single peer. And even if Meta had uploaded a single block containing some portion of a Plaintiff's work to another peer, this would likely have amounted to a negligible amount of content relative to the size of the work, and the block alone would itself have been unusable; the remaining blocks could have been obtained from other peers in the network, as I discuss in the next section.

B. Blocks Are Received from Multiple Connected Peers Simultaneously

58. As discussed in the Choffnes Report, "BitTorrent's efficiency and speed comes from its ability to download/upload pieces of a torrent to/from multiple peers simultaneously."[50] While it is true that the efficiency of the BitTorrent protocol comes from receiving data from multiple peers, the data being exchanged are the blocks that constitute these pieces. Therefore, a portion of the efficiency and speed of the BitTorrent protocol is owed to the ability to receive

[50] Choffnes Report, ¶17.

multiple blocks of data simultaneously from many peers.[51] Owing to this method of operation of the BitTorrent protocol, a peer can receive different blocks comprising the same piece from different peers. In other words, Choffnes has provided no evidence that any peer received a full piece from any other peer during the download of a torrent payload.

59. Individual blocks are unusable until all the blocks have been received,[52] and, Dr. Choffnes has provided no evidence that Meta shared all blocks comprising a piece of a Plaintiffs' works to peers during the leeching phase of the torrent download process. As a result, even if the Choffnes Report had provided a reliable probability estimate (which as I will explain below, it did not) that Meta had shared some portion of Plaintiffs' works during the leeching process, it is unlikely that Meta uploaded all (or any usable number of) the blocks of a piece comprising the Plaintiffs' works. Accordingly, in light of all of the constraints and conditions that must have aligned, it is highly unlikely that Meta uploaded entire usable pieces containing Plaintiffs' works to other peers during download of the at-issue datasets.

60. My opinion is further supported by Amazon Web Service (AWS) cost and usage data that reports the amount of data that was uploaded and downloaded by Meta's AWS instances between March and July 2024,[53] when the download process for LibGen, ZLib, and IA took

---

[51] "Libtorrent," libtorrent, accessed March 28, 2025, https://libtorrent.org/reference-Torrent_Handle.html#enum-block-state-t.

[52] Even if a specific file is less than a piece size, it would not be accessible until all the blocks comprising that piece have been received, assembled, verified, and saved, as discussed above.

[53] The AWS billing data contained within Meta_Kadrey_00237299, was provided to me by counsel, after verifying that these billing logs pertain to instances that were utilized by Meta for the torrent downloads of LibGen, ZLib, and IA that took place in April-July 2024. The AWS instances are also identified in Meta_Kadrey_00237286. Duplicate rows are removed from the data, and filtering for line items that pertain to transfers with other computers over the Internet (*i.e.*, USE2-DataTransfer-In-Bytes/External and USE2-DataTransfer-Out-Bytes/External) resulting in the 30% upload to download ratio through April to July 2024. I have also received another set of AWS billing data (Meta_Kadrey_00237297) that I understand relates to a later download of data from a dataset known as "Duxiu" that began in or about August 2024, which I understand comprises a collection of Chinese works. I did not analyze this data as Duxiu was not referenced in the Choffnes Report to which I am responding, and I am not aware of copyright infringement allegations in this case relating to works in Duxiu.

place.[54] This data (which I understand was produced in discovery in this case on March 19, 2025 pursuant to a limited reopening of discovery) indicates that, on average, the amount of data uploaded from these AWS instances to the Internet would not have exceeded approximately 30% of the amount of data that these AWS instances downloaded from the Internet in connection with the April to July 2024 torrent download for Internet Archive, ZLib, and LibGen. On average, peers could have received from Meta, approximately 30% of the data that Meta downloaded, further indicating that it was unlikely that Meta uploaded any of the Plaintiffs' works (or any usable portion of them) to peers during either the seeding or the leeching phases.

61. In the next section, I discuss another mischaracterization of the BitTorrent protocol in the Choffnes Report, specifically the introduction of his theory that BitTorrent's "holepunch extension" would provide a method for leeching peers to bypass Meta's network configuration.

62. I note that during the deposition of Dr. Choffnes, he testified that he did not have the AWS data and other documents at the time he submitted his report, and stated that if given an opportunity, he would update his report and would supplement his Bernoulli experiment with this information.[55] Dr. Choffnes did not specify how he would change his opinions or his models based on this evidence if allowed, and as such, I cannot respond to any such opinions at this time. In the event Dr. Choffnes is allowed at a later date to again supplement his expert analysis, I reserve my right to respond to the extent allowed by the Court.[56]

---

[54] Table 3 of my Rebuttal Report reported a total download of 267.4 TB across LibGen Non-Fic, IA and ZLib in 2024. A closer inspection of the file lists for IA and ZLib revealed that they contain both the .tar files and the individual files that exist within the same .tar files. These .tar files were counted towards the calculated total. After deduplicating by removing all .tar files, we obtain deduplicated total amounts of 112.9 TB for IA (as opposed to 193.5 TB), and 49.17 TB for ZLib (as opposed to 63.6 TB). I provide a revised version of Table 3 from my Rebuttal Report in Appendix A below. This does not change the piece level percentages presented in my rebuttal report.

[55] Choffnes Depo., 128:1-17, 132:3-133:18.

[56] Dr. Choffnes also testified during his deposition that that the total amount of data downloaded between April 5, 2024, and June 21, 2024, was 270 TB downloaded, and 62 TB uploaded. This

C. Holepunch Extension Does Not Allow Unsolicited Peers to Connect with Meta

63. The Choffnes Report attempts to brush off the significance of Meta's firewall protections that are intended to block inbound connections unless Meta had previously and affirmatively initiated a connection with the receiving peer.[57] The Choffnes Report states that every home router firewall shares with Meta this "standard" behavior of blocking unsolicited inbound connections. This fails to recognize that instead of a single standard there are multiple ways firewalls can work. The Session Traversal Utilities for NAT ("STUN") protocol specification discusses the various ways that Network Address Translation ("NAT") firewall implementation can work and describes four such ways.[58] The effect of different firewall setups is also explained in the stackoverflow.com post referenced by the Choffnes Report: "Also, if the [sic] neither NAT is a full-cone (or let's say, p2p-friendly) it may not be possible for the peers to connect. A p2p-friendly NAT generally accepts incoming connections from IPs they have not had any interaction with previously."[59]

64. As demonstrated by this citation, while it is true that the BitTorrent protocol provides a "holepunch" feature, this mechanism is not always supported. Moreover, even when enabled, there is no guarantee that the requested connection will be successful. For example, in order to use the "holepunch" feature to communicate with a peer behind the firewall, the initial peer requires the assistance of a "relay" peer. However, if the initial peer selects a relay peer that is not already connected to the peer behind the firewall, the holepunch fails. This situation

---

amount appears to be overstated; as I noted in my SJ Declaration (footnote 28), there are duplicates in the AWS billing data spreadsheet (Meta_Kadrey_00237299) for the April-July 2024 time period, in many cases having more than one line item corresponding to a single transmission or receipt of data. After deduplication, this data shows 134.6 TB of data downloaded from the Internet, and 40.42 TB of data uploaded to the Internet. I note that Meta has since produced a de-duplicated spreadsheet for this time period (Meta_Kadrey_00238140), which shows numbers that are consistent with the earlier spreadsheet.

[57] Choffnes Report, ¶¶8-11.

[58] RFC 3489, "STUN - Simple Traversal of User Datagram Protocol (UDP) Through Network Address Translators (NATs)", Internet Engineering Task Force, March 2003 at page 5.

[59] Choffnes Report, ¶11 footnote 3.

happens often because the holepunch extension does not provide a way for the original peer to learn which relay peers are connected to their peer of interest. The same stackoverflow.com post referenced by the Choffnes Report also states about holepunch that "[t]his only works if the swarm has at least one peer that's not behind a NAT."

65. As I discuss below, the supposed "hole-punching" method identified in the Choffnes Report is only an extension of the BitTorrent protocol and does not guarantee a successful connection. The hole-punch attempt must meet multiple conditions in order to facilitate any connection.[60] As the "Holepunch extension" page cited by the Choffnes Report states: "The initiating peer sends a rendezvous message to the relaying peer, containing the endpoint (IP address and port) of the target peer. If the relaying peer is connected to the target peer, and the target peer supports this extension, the relaying peer sends a connect message to both the initiating peer and the target peer, each containing the endpoint of the other. Upon receiving the connect message, each peer is directed to initiate a uTP connection to the other peer."[61,62]

66. Accordingly, even if Meta had utilized this functionality, it would still need to send an outbound request to the relaying peer with the intention of connecting with another "target" peer. Similarly, if another initiating peer wanted to connect to Meta (now the target peer), without Meta sending the initial request, the description of "holepunch" that the Choffnes report relies on suggests that there would still need to be an outbound request from Meta's instance to initiate the uTP connection to that initiating peer. Indeed, the Choffnes Report concedes that this peer exchange protocol only "allow incoming connections by first attempting an outbound connection."[63]

---

[60] *E.g.*, the holepunch extension must be enabled for the initiating peer, the target peer, and the relay peer, and the relay peer must already be connected to the requested target peer.

[61] "Bep_0055.Rst_post," accessed March 20, 2025, https://www.bittorrent.org/beps/bep_0055.html.

[62] Choffnes Report, ¶11 footnote 4.

[63] Choffnes Report, ¶11.

67. Therefore, despite this functionality within BitTorrent, it remains the case that Meta must have initiated the connection with any leecher with which it can exchange data, as all other leechers attempting to initiate requests for pieces of the dataset from Meta would have been rejected by Meta's network configuration.

VII. ASSUMPTIONS IN THE CHOFFNES REPORT ARE BASELESS AND HIS PROPOSED "MODELING" FLAWED

68. The Choffnes Report makes numerous assumptions in order to overestimate Meta's potential involvement in sharing any of the Plaintiffs' works. As I detail in this section, these assumptions fail to capture the complexity of the torrenting process and instead rely on unsubstantiated generalizations.

A. Use of Bernoulli Experiments for Modelling BitTorrent Activity is Incorrect

69. The Choffnes Report relies "on a Bernoulli experiment," "[t]o calculate the probability that Meta shared at least one piece of Plaintiffs' works."[64] A Bernoulli trial provides a probability in a simplified scenario involving one or more independent events that have exactly two possible outcomes (*i.e.*, success or failure, true or false, etc.).[65] A textbook example of a Bernoulli trial, described in the Wikipedia page cited by the Choffnes Report,[66] is flipping a coin; each flip has exactly two possible outcomes (heads or tails), so the probability of either outcome is 0.5, and that probability remains the same for each successive coin flip.

70. Dr. Choffnes' reliance on a Bernoulli experiment is inapplicable because the underlying conditions for using a Bernoulli experiment do not exist when applied to the probability of Meta having uploaded via the BitTorrent protocol.

---

[64] Choffnes Report, ¶24.

[65] "Bernoulli Trial - an Overview | ScienceDirect Topics," accessed March 31, 2025, https://www.sciencedirect.com/topics/mathematics/bernoulli-trial.

[66] "Bernoulli Trial," in Wikipedia, March 16, 2025, https://en.wikipedia.org/w/index.php?title=Bernoulli_trial&oldid=1280820336 (cited in Choffnes Report, ¶24 n.12.).

71. One of the most important conditions in the Bernoulli experiment is that each trial (*i.e.*, upload opportunity) be *independent* of other trials.[67] However, within the BitTorrent protocol, each upload opportunity influences the next, because the decision to choke peers is dependent on how much data is provided by the peer during the last opportunity. For instance, if the upload of data to a peer succeeds, that has an immediate effect on the bandwidth calculations conducted to select peers in the next cycle of upload.[68]

72. In order to use a Bernoulli experiment, therefore, the Choffnes Report is forced to assume that "the probability of BitTorrent picking a piece of Plaintiffs' works is ***fixed*** and ***statistically independent***."[69] He further explained in his deposition that "fixed" means that "the probability doesn't change over time," and for "statistically independent," he referred to the example provided above, "where one coin toss or I think you were about to say roll of the dice is not dependent on the previous one. These are the conditions required to use the Bernoulli experiment theory."[70] These two conditions are required because, he explained, "[t]he math changes and gets a lot more complicated" if you do not observe those two conditions.[71]

73. But the probability of whether Meta shared a piece of Plaintiffs' works is neither "fixed" nor "statistically independent," and thus does not meet ***either*** of the conditions required to use a Bernoulli experiment. The probability that Meta shared a piece of Plaintiffs' works would have shifted over time, depending on a number of dynamic interdependencies and variables including the shifting constitution of the torrent swarm, the particular pieces that peers have already downloaded, the pieces that are requested by other peers, the bandwidth of the peers in the swarm, and a number of other interdependent factors as described below. And framing the probability as a binary question of whether Meta uploaded a "piece" containing Plaintiffs'

---

[67] Alvin W Drake, "Fundamentals of Applied Probability Theory." p,124.

[68] Bram Cohen, "Incentives Build Robustness in BitTorrent." https://www.bittorrent.org/bittorrentecon.pdf. "*The value of bandwidth shifts rapidly over time as resources go away and become available,*" p,4.

[69] Choffnes Report, ¶24.

[70] Choffnes Depo., 77:2-20.

[71] Choffnes Depo., 77:21-25.

works is overly simplified because, as noted, peers can download blocks within the same piece in parallel from multiple different peers. The question of whether Meta uploaded a "piece," as a yes/no question, is misguided and ignores the partial nature of any potential contribution.

B. Assumptions Regarding Opportunity to Upload are Mischaracterized

74. The Choffnes Report also relies heavily on the idea that there were many potential opportunities for Meta to have uploaded during the leeching process, which he calculates by multiplying the number of unchoke slots by a calculated number of unchoke intervals.[72] A key problem with this assumption is that it captures, at most, a *potential* opportunity for uploading and not an instance of *actual* uploading – let alone uploading of a piece containing Plaintiffs' works. By assuming that every unchoke interval represents an *actual* upload of data, the Choffnes Report ignores the prerequisites that must be satisfied for the upload to take place. A peer being unchoked, in other words, does not necessarily indicate that Meta actually uploaded to that peer, let alone that Meta actually uploaded any portions of any Plaintiff's book to that peer.

75. As discussed in my Rebuttal Report, setting aside any consideration of blocks, a peer must still have requested the specific piece constituting a Plaintiff's works from Meta, in order to receive that piece at the time the peer is in an unchoked slot.[73] A peer simply being unchoked by Meta does not indicate that Meta actually uploaded data to that peer,[74] and the Choffnes Report ignores important considerations such as whether the peer has interest in a specific piece containing the Plaintiffs' works (as well as the other factors identified in **Section V** above).

76. Another important consideration that the Choffnes Report ignores was the constitution of the swarm during torrent download process. The Choffnes Report's calculation of upload

---

[72] Choffnes Report, ¶23, Table 2.

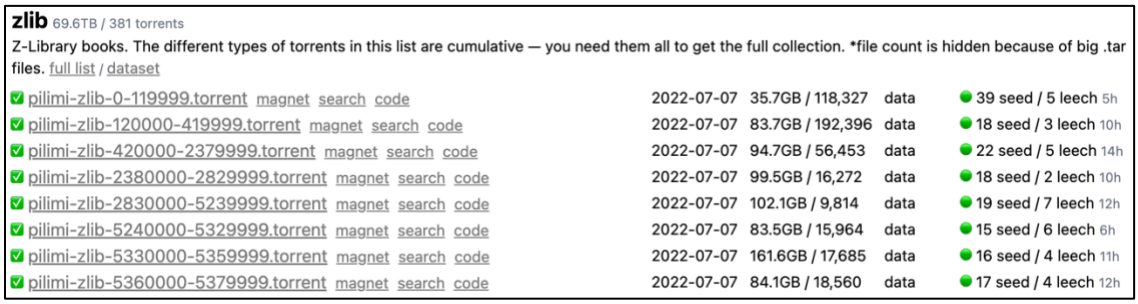
[73] Frederiksen-Cross Rebuttal Report, ¶¶123, 124.

[74] "Note that this does not necessarily mean that peer B is uploading data to A, but rather that B will upload to A if A issues a data request." Arnaud Legout et al., "Clustering and Sharing Incentives in BitTorrent Systems," https://read.seas.harvard.edu/~kohler/pubs/legout07clustering.pdf.

opportunities assumes that the swarm would have included at least eight (8) leechers present to occupy all of Meta's unchoke slots through the entire duration of the torrent download. But the Choffnes Report provides no evidence whatsoever to support this assumption, and as noted above, the AWS cost and usage data produced by Meta undermines this assumption.

77. And although the constituents of a swarm are dynamic and can continuously change, the list of torrents from the Annas-Archive website provides some indication of swarm composition as it provides a current list of torrents with a number of active seeders and leechers in the swarm. For example, **Figure 3** below depicts a list of the first eight torrents from Anna's Archive for the ZLib dataset showing fewer leechers but a significant number of seeders.

Figure 3: List of Torrent Files Available on Anna's Archive for ZLib[75]



zlib 69.6TB / 381 torrents

Z-Library books. The different types of torrents in this list are cumulative — you need them all to get the full collection. *file count is hidden because of big .tar files. full list / dataset

pilimi-zlib-0-119999.torrent magnet search code	2022-07-07	35.7GB / 118,327	data	39 seed / 5 leech 5h
pilimi-zlib-120000-419999.torrent magnet search code	2022-07-07	83.7GB / 192,396	data	18 seed / 3 leech 10h
pilimi-zlib-420000-2379999.torrent magnet search code	2022-07-07	94.7GB / 56,453	data	22 seed / 5 leech 14h
pilimi-zlib-2380000-2829999.torrent magnet search code	2022-07-07	99.5GB / 16,272	data	18 seed / 2 leech 10h
pilimi-zlib-2830000-5239999.torrent magnet search code	2022-07-07	102.1GB / 9,814	data	19 seed / 7 leech 12h
pilimi-zlib-5240000-5329999.torrent magnet search code	2022-07-07	83.5GB / 15,964	data	15 seed / 6 leech 6h
pilimi-zlib-5330000-5359999.torrent magnet search code	2022-07-07	161.6GB / 17,685	data	16 seed / 4 leech 11h
pilimi-zlib-5360000-5379999.torrent magnet search code	2022-07-07	84.1GB / 18,560	data	17 seed / 4 leech 12h

78. In this example, had Meta been involved in any of the swarms listed above, it would not have filled eight unchoke slots that are a key assumption behind the probability estimates in the Choffnes Report. And even if other peers had been assigned to Meta's unchoke slots, the Choffnes Report does not consider the presence of the ***seeders*** in the swarm who already downloaded the entire torrent file, who would have provided attractive alternatives in providing blocks as compared to a non-seeding peer such as Meta. The Choffnes Report does not provide any evidence or even reasoned analysis to support the assumption that eight (8) leechers would have been present in the swarm (in addition to Meta), occupying all eight unchoke slots, through the entire duration of the download process. Dr. Choffnes admitted

[75] "Torrents ZLib - Anna's Archive," accessed April 1, 2025, https://annas-archive.org/torrents/zlib.

during his deposition, in fact that it is not always the case that (1) all eight unchoke slots will be filled, or (2) even if a peer is in an unchoke shot, that data will be uploaded to it.[76]

79. The fact that the Choffnes Report vastly overestimates the amount of data that was likely uploaded by Meta is further confirmed by the fact that, as noted in Paragraph 60 above, Meta could only have uploaded a maximum of approximately 30% of the data it downloaded (based on the cost and usage data discussed above), during the download process that took place between April-July 2024. This data further undermines the assumption that the number of upload "opportunities" reported in the Choffnes Report represent actual uploads. By relying on calculations based only on unchoke intervals and unchoke slots, the Choffnes Report derives a hypothetical estimate for the number of times that Meta's libtorrent client "had an opportunity to offer a new piece to a new peer[.]"[77] But as the table below shows, this number of opportunities "to offer a new piece to a new peer" results in an upload-to-download ratio that cannot be reconciled with the actual data:

Table 3: Estimated Upload to Download Ratio Based on Estimations in the Choffnes Report

Dataset	Total Number of Pieces in Torrents Containing Plaintiffs' Works	Choffnes Report Upload Opportunities	Calculated Upload To Download Ratio Utilizing Methodology in the Choffnes Report
LibGen Non-Fiction	5,163	3,840	74.38%
IA	353,119	507,840	143.82%
ZLib	1,468,494	5,115,840	348.37%

80. The second column shows the total number of pieces in the particular downloaded torrents that contain Plaintiffs' works, and the third column shows the number of supposed upload

[76] Choffnes Depo., 94:11-96:7.

[77] Choffnes Report, ¶21.

opportunities as calculated by the Choffnes Report for those works (calculated by multiplying the values in Columns 3 and 4 in Table 2 in the Choffnes Report).[78] Column 4 in the table presented above shows calculated upload-to-download ratios obtained utilizing Dr. Choffnes' methodology, *i.e.*, a percentage based dividing the third by the second columns. As shown, because the Choffnes Report assumes that data was uploaded with each supposed upload opportunity, it assumes that Meta uploaded far more data than it actually did – by roughly 3x for LibGen Non-Fiction, by roughly 5x for IA, and by roughly 12x for ZLib. In other words, the fact that Meta could only have uploaded a maximum of approximately 30% of the data it downloaded indicates that the Choffnes Report's assumptions about upload opportunities, and actual uploading, are vastly overstated.

81. The Choffnes Report maintains that "[t]o BitTorrent, the sizes of files associated with each torrent do not affect uploading at all. The only thing that matters is which pieces are available to download, and which ones are needed."[79] While it is true that piece requests and availability are important factors, it is not accurate to wholly discount file sizes. Torrent file sizes, coupled with swarm sizes and piece availability, do affect torrent download (and consequently, upload) duration, a fact that the Choffnes Report ignores. Further, the Choffnes Report also ignores the requirement for specific pieces to be requested by a peer in his analysis. As I discuss in the following section, the Choffnes Report further ignores other aspects of the BitTorrent protocol, specifically the effects of swarm dynamics, that ultimately dictate the requirement for specific pieces during the leeching phases of the torrent payload.

C. Assumptions Regarding the Download and Availability of Pieces from Meta's Instance are Erroneous

82. The probabilities presented in the Choffnes Report further rely on the chance of "mutual interest in one piece" by a peer and Meta. This "mutual interest" relies on two assumptions that consider that at a particular point in time, (i) the chance that Meta has a piece containing the Plaintiffs' work already downloaded and ready to share, is 50%, and (ii) the chance that

[78] Choffnes Report, ¶23, Table 2.
[79] Choffnes Report, ¶15.

Meta unchoked the peer is 50%.[80] Both of these assumptions are gross oversimplifications that lack any evidentiary support and fail to capture the complexity of the dynamic process of downloading via the BitTorrent protocol and ignores key characteristics such as the receiving peer's "interest" state at the time it is unchoked.

83. As discussed in my Rebuttal Report, many BitTorrent clients rely on a rarest-first approach, which prioritizes downloading pieces that fewer peers currently possess.[81] This ensures that otherwise-scarce pieces are disseminated throughout the swarm, but it also means that truly rare pieces may be harder to obtain early on. As a result, whether Meta's AWS instances downloaded—and therefore could have shared—a particular piece containing the Plaintiffs' works would have depended, in large part, on how available that piece was among the swarm at the time of download. Consequently, the chance that Meta held a piece containing Plaintiffs' works that was available to be shared with other peers could not be arbitrarily and retroactively assumed to be a discrete value (as the Choffnes Report assumes), because the probability of obtaining a piece with the Plaintiffs' works would have been influenced by both its relative rarity and the dynamic behavior of the swarm.

84. Additionally, the Choffnes Report considers "a 50% chance that the peer connected to Meta's libtorrent client has a piece that Meta wants. In this case, the peer is unchoked due to mutual interest."[82] But as discussed above, the decisions for unchoking a peer at a particular time are not dictated solely by "mutual interest," but instead made after consideration of other factors such as the tit-for-tat strategy, which considers the speed at which pieces are uploaded by another peer to Meta. Therefore, the chance that a particular peer is unchoked depends on the number of available unchoked slots (as discussed, eight in Meta's case) and each peer's individual bandwidth and whether it has previously uploaded any data to Meta.[83] In turn, this

---

[80] Choffnes Report, ¶21.

[81] Frederiksen-Cross Rebuttal Report, ¶¶ 65, 125.

[82] Choffnes Report, ¶21.

[83] Stated another way, the greater the number of leechers (more than 8), the greater the number of leechers that will be left waiting for a turn to unchoke with Meta (although they may be unchoked to some other peer while they wait, getting their pieces elsewhere).

metric also depends on factors such as the number of peers in a swarm, and the health of the swarm (i.e., if there are more seeders or leechers). Measuring such metrics for each peer as a single discrete value, as done in the Choffnes Report, will inevitably lead to an overestimate of uploading data by any one peer. Thus, the stated probability for unchoking a given peer is incorrect in the Choffnes Report.

85. Given these flawed assumptions, the Choffnes Report's calculated mutual interest percentage is inaccurate due to its compounding of at least these two errors.

VIII. THE CHOFFNES REPORT INACCURATELY ASSERTS MISSING EVIDENCE

86. The Choffnes Report asserts "Frederiksen-Cross refers to multiple versions of code in paragraph 77 of her report, but only one copy of one version of code has been furnished for inspection."[84] However, there are two versions of the **download_trnts.py** code file that I have relied upon and included in Appendix D of my Rebuttal Report. These two files pertain to March and August 2024 snapshots of the code implemented to download the "scimag" portions of LibGen library. It is my understanding that these same two copies were made available in the code snapshots the Plaintiffs' expert Dr. Krein reviewed.

87. Further, as noted in my Rebuttal Report, both these versions include an 'Example command,' in the form of a comment that mentions the "LibGen fiction" library. The Choffnes Report presents further speculation that "[g]enerally speaking, programmers do not provide such specific working commands as examples unless they have tested them first, i.e., they have run the command in the comment."[85] However, as made clear from a review of the source code files, the produced downloaded files list, and confirmed by my interview with the Meta engineer responsible for the torrent download, it is clear that none of the LibGen fiction library's data was torrented by Meta in 2024.[86] The evidence to support this assertion was furnished with my rebuttal report.

---

[84] The Choffnes Report, ¶38.

[85] The Choffnes Report, ¶33.

[86] Frederiksen-Cross Rebuttal Report, ¶78.

88. The Choffnes Report also states that "[i]nformation about when torrented data files were created, and when they were last modified, can identify the period when downloading was occurring. This information has not been provided."[87] He also claims that "Frederiksen-Cross's report does not address whether S3 storage data was reviewed, which could provide additional evidence of torrenting activities."[88] But Dr. Choffnes ignored the extensive information about the downloaded files that I provided with my Rebuttal Report, which included file lists showing the locations (pathnames), filenames, file sizes, and date/time information for each file in each of the three at-issue datasets (*i.e.*, LibGen-NonFic, IA, Z-Lib). For example, the following is an exemplary portion of the file list data for the downloaded Internet Archive files, that was provided with my Rebuttal Report:

Figure 4: Example of Downloaded File List for ZLib From Meta

```
2024-06-14 15:29:30  33528844 data/annas_archive/internet_archive/data/a/a2businessstudie0000surr.pdf
2024-06-14 15:29:30   5113426 data/annas_archive/internet_archive/data/a/a2businessstudie0000woli.pdf
2024-06-14 15:29:30  20162172 data/annas_archive/internet_archive/data/a/a2chemicalstoryl03edunse.pdf
2024-06-14 15:29:30  20208865 data/annas_archive/internet_archive/data/a/a2chemistryforaq0000atki.pdf
2024-06-14 15:29:31  24862058 data/annas_archive/internet_archive/data/a/a2chemistryforaq0000harw.pdf
2024-06-14 15:29:31   4692940 data/annas_archive/internet_archive/data/a/a2chemistryunit20000harr.pdf
2024-06-14 15:29:31   5375564 data/annas_archive/internet_archive/data/a/a2chemistryunit20000harr_t5t9.pdf
2024-06-14 15:29:31   4627062 data/annas_archive/internet_archive/data/a/a2chemistryunit20000smit.pdf
2024-06-14 15:29:31   6579257 data/annas_archive/internet_archive/data/a/a2chemistryunit40000gold.pdf
2024-06-14 15:29:32   5877879 data/annas_archive/internet_archive/data/a/a2clicsdelamour60000cout.pdf
```

89. Despite the extensive amount of information provided with my Rebuttal Report, it appears that Dr. Choffnes did not review any of it. When asked about the file list information, he explained, "I did not spend any time looking at the files, file paths, names or anything like that in her report."[89] His assertions regarding missing evidence are thus unsubstantiated and without merit.

90. Finally, the Choffnes Report states that "[a]ccording to Meta_Kadrey_00107954, the following text indicates that torrenting was used for 10TB of Libgen data in 2024: 'Libgen (10 TB out of 10 TB): we got almost all we want (all torrents posted after 2023-03-01) with a few ones

[87] Choffnes Report, ¶ 37.

[88] Choffnes Report, ¶ 31.

[89] Choffnes Depo., 101:3-9.

pending.'"[90] Dr. Choffnes states that "[t]here needs to be corresponding details provided to explain this discrepancy," [91] but the Choffnes Report does not identify any purported "deficiency." As I discuss in my Rebuttal Report, Meta downloaded portions of the Libgen.rs Non-Fiction library through BitTorrent protocol during 2024, and as I explained, the total amount of downloaded data from that library as determined from the **meta_nonfic_downloads.txt** list (provided with my report) was approximately 10.3 TB,[92] which is consistent with the number reported at Meta_Kadrey_00107954. There is thus no "discrepancy" between the size of the LibGen data reported.

91. During his deposition. Dr. Choffnes stated that the "discrepancy" was based on his belief that the "fiction" portion of the LibGen data was downloaded in 2024.[93] He also referred to a document, Meta_Kadrey_00237286, during re-direct examination showing certain filepaths including "libgen_li_fic," "libgen_rs_fic" and "scihub." But this document does not demonstrate that LibGen data was downloaded for any portion other than the nonfiction library referenced above. I also confirmed with Ms. Xiaolan Wang that this document was provided to her by Mr. David Esiobu, who set up the AWS instances for downloading of the Anna's Archive data as explained in my Rebuttal Report.[94] She further confirmed that Mr. Esiobu downloaded and collected the ".torrent" files from the Anna's Archive website and placed them into the folders identified in Meta_Kadrey_00237286, but that Mr. Esiobu had not downloaded the underlying torrent content (payload). As explained in my Rebuttal Report, a torrent file "does not contain the underlying content to be downloaded; it instead contains the metadata required to reconstruct and validate the payload, including an ordered list of names, and sizes of the files."[95] Accordingly, the fact that Meta downloaded torrent files associated with fiction portions of the LibGen library does not show that Meta downloaded the underlying

---

[90] Choffnes Report, ¶ 39.

[91] Choffnes Report, ¶ 39.

[92] Frederiksen-Cross Rebuttal Report, ¶ 113, Table 3.

[93] Choffnes Depo., 110:14-21.

[94] Frederiksen-Cross Rebuttal Report, ¶ 104 & footnotes 191-192.

[95] Frederiksen-Cross Rebuttal Report, ¶ 52.

data. There is no evidence that the fiction portions of the LibGen library (separate from the torrent files) were downloaded during the dataset torrent download process that took place in 2024, and Ms. Wang confirmed to me that they were not.

92. For the same reason, Dr. Choffnes' speculation in Paragraph 32 of additional torrenting of LibGen fiction in 2024 is unfounded; as noted, while the *torrent files* for LibGen fiction were downloaded by Mr. Esiobu and placed into directories, there is no evidence that Ms. Wang subsequently downloaded the underlying torrent payload.

IX. CONCLUSION

93. In this report, I address the assertions made in the Choffnes Report which pertain to the possibility that Meta shared any of the Plaintiffs' works during the leeching phase of downloading data using the BitTorrent protocol. As I discussed in **Section V**, there are a multitude of factors that must align in order for Meta to share any of the Plaintiffs' works during the leeching phase.

94. To summarize, all of the following factors must be met for Meta to share any of the Plaintiffs' works during the leeching phase: (i) Meta must have previously and affirmatively initiated a connection with a leecher, (ii) Meta must have already downloaded the pieces containing the Plaintiffs' works and made them available to share, (iii) the receiving peer must not have already downloaded the pieces containing Plaintiffs' works and must also be prioritizing those pieces for download, (iv) the pieces being prioritized must contain the portion of data out of all the data in the dataset that contains a given Plaintiff's works, (v) out of all the peers the receiving peer is connected to that also have the piece, Meta must have been the one chosen as the source for seeding, (vi) the receiving peer must have uploaded sufficient data to Meta to be considered for an unchoke slot,[96] and (vii) Meta must have shared all the blocks pertaining to pieces that comprise the Plaintiffs' works. The Choffnes Report ignores several of these

[96] The peer could be subject of an optimistic unchoke, which are limited for only 20% of all unchoke slots (20%) and only rotate on an interval of 30 seconds. *See*: "Libtorrent," libtorrent, accessed March 20, 2025, https://www.libtorrent.org/reference-Settings.html#settings_pack.

factors, which ultimately make it unlikely that Meta shared any complete pieces of the Plaintiffs' works during the download in March – July 2024.

95. Furthermore, the probability estimates in the Choffnes Report are based on several incorrect interpretations of the BitTorrent protocol's operation and overlook several conditions that must be met for Meta to share any portions of the Plaintiffs' works with other peers. In fact, as I discuss in **Section VII** above, the model utilized in the Choffnes Report, as well as the underlying assumptions are not appropriate for modeling the exchange of data through the BitTorrent protocol, rendering the probability estimates presented in the Choffnes report unreliable.

X. APPENDIX A: REVISED SIZES OF PLAINTIFFS' WORKS ACROSS DATASETS

Table 4: Revised Table 3 From Rebuttal Report With Deduplicated Totals for Size of Plaintiffs' Works Across Torrented Datasets[97]

Dataset	Total Size of Downloaded Dataset	Proportion of Plaintiff Works			
		Average	Lowest	Highest	Total
LibgGen.rs Non-Fiction (Scitech Only)	10.3 TB	7.5 MB (0.00007%)			
Internet Archive (IA)	112.9 TB	48.2 MB (0.00004%)	6.8 MB (0.0000057%)	215.9 MB (0.00018%)	2311.9 MB (0.0019%)
Z-Library (ZLib)	49.17 TB	11.0 MB (0.000093%)	0.1 MB (0.00000019%)	57.2 MB (0.00011%)	518.5 MB (0.0010%)

[97] The methodology for calculating these estimates is identical to the process utilized for estimating metrics in Table 3 of my Rebuttal Report. The total size of downloaded data is different as discussed in footnote 54 above.

XI. APPENDIX B: MATERIALS CONSIDERED

Web Articles

1. Jules Sam Randolph, "Answer to 'How Does Bittorrent Work?,'" Super User, October 25, 2014, https://superuser.com/a/831673.
2. "Libtorrent," libtorrent, accessed March 20, 2025, https://libtorrent.org/reference-Settings.html#choking_algorithm.
3. "Libtorrent," libtorrent, accessed March 20, 2025, https://www.libtorrent.org/reference-Settings.html#settings_pack.
4. "Libtorrent Manual," accessed March 28, 2025, https://www.libtorrent.org/tuning.html#understanding-the-disk-threads.
5. "Libtorrent/Src/Block_cache.Cpp at v1.2.19 · Arvidn/Libtorrent," GitHub, accessed March 28, 2025, https://github.com/arvidn/libtorrent/blob/v1.2.19/src/block_cache.cpp.
6. BitTorrent Limited, "Help Center - What Do the Terms 'hashfails' and 'Wasted' Mean?," BitTorrent, accessed March 28, 2025, https://www.bittorrent.com/en/support/solutions/articles/29000022802-what-do-the-terms-hashfails-and-wasted-mean-.
7. "Libtorrent Manual," accessed March 28, 2025, https://www.libtorrent.org/tuning.html#understanding-the-disk-threads.
8. "Bep_0052.Rst_post," accessed March 20, 2025, https://www.bittorrent.org/beps/bep_0052.html.
9. "Resolve Damaged Document Error When Opening PDF Files," accessed March 20, 2025, https://web.archive.org/web/20240127090015/https:/helpx.adobe.com/acrobat/kb/pdf-error-1015-11001-update.html.
10. "FlightDeck - Handbook - Zipping an EPUB," accessed March 21, 2025, https://ebookflightdeck.com/handbook/zipping.
11. "The King James Holy Bible," n.d., https://www.holybooks.com/wp-content/uploads/2010/05/The-Holy-Bible-King-James-Version.pdf., after removal of the cover and index pages.

12. "Libtorrent," libtorrent, accessed March 28, 2025, https://libtorrent.org/reference-Torrent_Handle.html#enum-block-state-t.
13. "Bernoulli Trial - an Overview | ScienceDirect Topics," accessed March 31, 2025, https://www.sciencedirect.com/topics/mathematics/bernoulli-trial.
14. "Bernoulli Trial," in Wikipedia, March 16, 2025, https://en.wikipedia.org/w/index.php?title=Bernoulli_trial&oldid=1280820336.
15. Bram Cohen, "Incentives Build Robustness in BitTorrent." https://www.bittorrent.org/bittorrentecon.pdf. "The value of bandwidth shifts rapidly over time as resources go away and become available,".
16. "Torrents ZLib - Anna's Archive," accessed March 20, 2025, https://annas-archive.org/torrents/zlib.
17. "Bep_0055.Rst_post," accessed March 20, 2025, https://www.bittorrent.org/beps/bep_0055.html.

Academic Articles

1. Arnaud Legout et al., "Clustering and Sharing Incentives in BitTorrent Systems," https://read.seas.harvard.edu/~kohler/pubs/legout07clustering.pdf.

Textbooks

1. Alvin W Drake, "Fundamentals of Applied Probability Theory."

Internal Documents

1. Meta_Kadrey_00237299.
2. Meta_Kadrey_00237286.
3. Meta_Kadrey_00107954.
4. Meta_Kadrey_00237297.
5. Meta_Kadrey_00238140.

Expert Reports / Testimony

1. Frederiksen-Cross Rebuttal Report (February 10, 2025).
2. Choffnes Rebuttal Report (February 26, 2025).
3. Choffnes Deposition Transcript, March 28, 2025.

XII. APPENDIX C: CURRICULUM VITAE

Curriculum Vitae, Qualifications, Testimony

Barbara A. Frederiksen-Cross

JurisLogic, LLC.
850 NW Summit Avenue
Portland, OR 97210-2816
Tel: (503) 200-2738

barb@jurislogic.com

Qualifications

Education and Experience

Barbara Frederiksen received her basic education at American public schools and completed her High School education at Chemeketa Community College, at the age of sixteen.

She continued her education there, receiving an Associate of Applied Science degree in Computer Programming in 1974 at the age of eighteen.

Since then, she has continued her professional education with technical training from IBM, Amdahl, Hitachi Data Systems, Verhoef, SAS Institute, Merrill Consultants, Microsoft, and other education providers. This education has included advanced training in operating system internals, telecommunication system internals, database internals, diagnostics, system performance engineering, storage management, capacity planning, and data recovery.

Ms. Frederiksen has 50 years' experience in the computer industry and has held positions as, in chronological order: mainframe and midrange applications programmer; system analyst; software development consultant; programming instructor (developing courses in CICS, OS JCL, and VSAM internals); database administrator; systems programmer (problem diagnosis, maintenance and customization of mainframe operating system software and other software products); system performance specialist (for batch, on-line, and database systems); regional manager for a software consulting service provider; operating systems software developer (developing software to enhance the performance of mainframe computing systems); systems programmer (performing hardware planning and performance evaluation, system tuning, network tuning, disaster recovery planning, and managing data availability policies and procedures); systems programmer (responsible for problem resolution, software installation, and system maintenance for mainframe and midrange systems); UNIX system administrator; capacity planner (monitoring business metrics, sales forecasts, computer system performance, directing tuning efforts, and planning upgrades for MVS, AS/400, NCR 3600, Teradata, UNISYS, and UNIX systems); and forensic software analyst.

Ms. Frederiksen was team leader for the storage management/capacity planning team of a fortune 100 company for over three years, responsible for software, robotic tape libraries, management policies, and automated processes used to backup and recover global enterprise computer systems. In this capacity she also developed complex mathematical models to analyze and predict computer performance and capacity demands for national, regional, and global computer operations.

Since 1996 Ms. Frederiksen has worked in the field of computer forensics, first as a consultant to Johnson-Laird Inc. ("JLI"), of Portland, Oregon and now as the director of litigation services for its successor company, JurisLogic, LLC.

Ms. Frederiksen has performed forensic software analysis for a variety of clients in over 100 civil and criminal matters. These matters include forensic software analysis in the context of copyright, patent, and trade secret disputes. She has analyzed computer software and source code in the context of over 40 Copyright/Trade Secret disputes. Her analysis experience with respect to these matters includes the evaluation and comparison of computer source code and object code to detect copying and derivative works, identification of third party and open source materials, analysis of architectural and other non-literal similarities, and analysis of computer source code to determine whether it incorporates or makes use of specific trade secrets. Copyright and Trade Secret clients include companies such as Caterpillar, Computer Associates, Compuware, FOREX Capital Markets, LexisNexis, iGPS, ProvoCraft, Symantec, and Webtrends.

Ms. Frederiksen has also analyzed computer software, source code, or prior art in the context of over 35 patent disputes with respect to both infringement and validity analysis. Her analysis experience with respect to these matters includes analysis to determine how software functions and whether it practices the specific invention claimed in the patent(s) in suit. She is also experienced in the analysis of computer software that may constitute prior art for litigated patents and analysis of the development history of computer software with respect to on-sale bar issues. Patent clients include companies such as Active Video Networks, Connectix Corporation, Encyclopaedia Britannica, Grantley Patent Holdings, Herman Miller, Hyundai, In-Three, Microsoft, MPI Technologies, Pitney Bowes, Siemens-Rolm, Teknowledge Corporation, and University of Pittsburgh.

Ms. Frederiksen has over 50 years personal experience as a software developer and consultant, and is familiar with licensing and contract practices common in the software industry as they apply to software consulting agreements, custom development, software licensing, and the sale of computer software. In the course of her career she has been responsible for negotiating consulting agreements and custom software development agreements as both a consultant and as a consumer of those services. She has been responsible for negotiating software license agreements for a fortune 100 company and also personally as both a licensee and licensor in such agreements. She has also developed software products and negotiated contracts for their subsequent sale.

Ms. Frederiksen has specialized knowledge of the analysis and remediation of failed software development efforts. She has been involved in software system audits performed by the State of Alaska, as well as forensic analysis relating to contractual disputes and litigation relating to failed software development efforts, licensing disputes, and the deployment and performance of software systems. As a forensic analyst, she has analyzed computer software, source code, and related computer-

based evidence in the context of nine Software Licensing and Software Development disputes and three internal investigations relating to due-diligence for software acquisitions.

Ms. Frederiksen also has over five years experience with the oversight and evaluation of clean room procedures used for software development. This experience includes the development of clean room protocols and clean-room oversight, as well as actual experience programming in a clean room environment. In the context of her work for JLI and JurisLogic, Ms. Frederiksen has developed, reviewed, and critiqued clean room protocols; prepared educational presentations on clean room procedures and protocols for JLI clients; assisted with clean room set-up and oversight; and evaluated software that was developed using clean room protocols to determine whether it was free of inappropriate materials. She has also provided testimony at arbitrations and hearings in the United States and Canada relating to clean room development procedures and protocols.

Ms. Frederiksen has experience in the design, implementation, and ongoing administration of databases and multi-dimensional data aggregation systems used to support business analysis, performance reporting, cross-system data sharing, and ad-hoc decision support queries. She has specific experience with the design, programming, tuning, and administration of the hardware, software, and underlying database management systems implemented to support batch and on-line query and update systems, data warehouses, and data marts. She has developed and written application software used to allow users to manipulate and analyze data using pre-defined reports and ad-hoc queries as well as software used in the context of high-volume real time transaction and messaging systems. This experience includes special training from professional organizations such as CMG, and over ten years experience in the evaluation, modeling, and tuning of hardware and software systems' performance and capacity.

She is experienced in the recovery, preservation, and analysis of computer-based evidence. Ms. Frederiksen has assisted with discovery and analysis of computer software and computer-based evidence relating to large scale product liability investigations such as the Vioxx, Propulsid, Rezulin, and Ford/Firestone matters. She has also provided forensic analysis in civil and criminal investigations relating to unauthorized computer access, sabotage, internet trespass, spyware deployment, evidence tampering, and identity theft; as well as analysis performed in the context of internal software audits, acquisitions, and internal investigations relating to employee conduct.

Ms. Frederiksen has provided evidence recovery and analysis in criminal cases for the FBI and for the defense in *State of California v. Saghari*. She was a police reserve specialist with the Hillsboro Police department 2002-2009, assisting in criminal investigations involving computer-based evidence.

Papers and Presentations

- "*Digital Evidence – Digital Dilemmas?"*; Tulane University Law School, New Orleans, Louisiana, February 12, 2025
- *"Digital Evidence – Digital Dilemmata"*; Tulane University Law School, New Orleans, Louisiana, March 15, 2023
- "*Prognostications on the Response of the Law to Technological Advances*" panel participant; Oregon State Bar Emerging Technologies-Charting the Future Course of the Law, Tigard, Oregon, October 12, 2018
- "*Cyber Liability from the Trenches: A Front Line Perspective*" (co-authored with Melissa Ventrone of Wilson Elser) Oregon State Bar Navigating the Pitfalls of an Online Business Presence-What Your Clients Need to Know, Tigard, Oregon, September 27, 2013
- "*Drones – A Culture of Fear*" District Of Oregon Conference Innovations in the Law: Science and Technology (joint effort of the US Court for the District of Oregon and the Oregon chapter of the Federal Bar Association), Portland, Oregon, September 20, 2013
- "*How Development Advances Put Security in Retreat*" NW ISSA Security Conference, Portland, Oregon, May 2, 2013
- *"Women in Computing"* Washington State University, Vancouver campus, Vancouver, Washington, March 28, 2011
- *"Open Source Issues in Mergers & Acquisitions"* (co-authored with Katherine C. Spelman, Esq.) Open Source & Security Cincinnati Intellectual Property Law Association (OSS3); Erlanger, Kentucky, October 27, 2011
- *"Reverse Engineering: Vulnerabilities and Solutions"* (co-authored with Susan Courtney) Pacific Northwest Software Quality Conference, Portland, Oregon, October 11, 2011
- *"Basic Computer Forensics (a lesson in modern Geek)"* Santa Clara Public Defenders' Office, San Jose, California, October 26, 2010
- *"Quality Pedigree Programs: Or How to Mitigate Risk and Cover Your Assets"* (co-authored with Marc Visnick and Susan Courtney) Pacific Northwest Software Quality Conference, Portland, Oregon, October 18, 2010
- *"Third Party Code Beware the Trojan Source!"* co-authored with Katherine C. Spelman, Esq., American Bar Association Section of Intellectual Property Law Landslide® Magazine, "in press"
- *"Finding the Snipers and Preserving the Evidence"* Oregon State Bar, Computer & Internet Law Section, Portland, Oregon, September 17, 2010

- *"Challenges in Corporate Forensics – Why Isn't Bigger Better?"* panel participant Digital Forensic Research Workshop (DFRWS), Portland, Oregon, August, 2010
- *"Beware of Geeks Bearing Gifts, Beware The Trojan Source!"* (co-authored with Kate Spelman, Esq.) University of Dayton School of Law: Significant Developments in the Intellectual Property Law of Computers and Cyberspace Conference, Dayton, Ohio, June 11, 2010
- *"Hack to the Future"* NW ISSA Security Conference, Portland, Oregon, May 6, 2010
- *"e-Discovery: Size Matters"* Oregon State Bar, Computer & Internet Law Section meeting, Portland, Oregon, February 23, 2010
- *"Software Pedigree Analysis: Trust But Verify"* (co-authored with Marc Visnick and Susan Courtney) Pacific Northwest Software Quality Conference, Portland, Oregon, October 28, 2009
- *"e-Discovery: Size Matters"* University of Dayton School of Law: Significant Developments in the Intellectual Property Law of Computers and Cyberspace Conference, Dayton, Ohio, June 12, 2009
- *"The Digital Detective: Looking for Evidence on Electronic Devices"* Portland State University, Mathematics Engineering Science Achievement (MESA) Conference, Portland, Oregon, April 11, 2009
- *"Computer Forensics in Civil Litigation"* Washington State University Vancouver, School of Engineering & Computer Science, Vancouver, Washington, April 7, 2009
- *"Discovering Electronic Evidence"* Tulane University Law School, New Orleans, Louisiana, March 18, 2009
- *"E-Discovery: A Survival Guide"* Tulane University Law School, New Orleans, Louisiana, March 16, 2009
- *"New Technology, New Challenges"* University of Dayton School of Law: Significant Developments In Computer & Cyberspace Law Convention, Dayton, Ohio, June 6, 2008
- "*Electronic Forensics - Today and Tomorrow* " Washington State University Vancouver, School of Engineering & Computer Science, Vancouver, Washington, April 1, 2008
- *Will Peer-to-Peer Disappear?* The Berglund Center for Internet Studies at Pacific University of Oregon, Forest Grove, Oregon, February 19, 2008
- *"Computer Forensics"* panel participant Portland Society for Information Management, Portland, Oregon, November 14, 2007

- *"Tuned In, Turned On, Spaced Out: How Technology is Changing Our Communities and Shaping Our Future"* panel participant Hillsboro Town Hall (Pacific Institute for Ethics and Social Policy), Hillsboro, Oregon, October 25, 2007
- *"Basic Computer Forensics (a lesson in modern Geek)*" Santa Clara Public Defenders' Office, San Jose, California, October 23, 2007
- *"Obtaining & Using Electronic Evidence"* panel participant 2007 National Employment Lawyers Association (NELA) Eighteenth Annual Convention, San Juan, Puerto Rico; June 27-30, 2007
- *"Where Are We Allowing Technology to Lead Us?"* University of Dayton School of Law Significant Developments In Computer & Cyberspace Law Convention, Dayton, Ohio, June 8, 2007
- "*Where Are We Allowing Technology to Lead Us*?" Computer Related Investigations, Management, and Education (CRIME), Hillsboro, Oregon, May 16, 2007
- *"Where Are We Allowing Technology to Lead Us?"* Keynote Address, International Technology Law Association Annual Meeting & World Conference, Chicago, IL; April 26-27, 2007
- *"The Law Firm's E-Data: A Risk Management Nightmare?"* panel participant 2007 Legal Malpractice & Risk Management Conference, Chicago, IL; March 6-9, 2007
- *"Computers and Disaster Planning: What Can We Learn from Katrina and SARS?"* Cutting Edge Issues in Technology Law, Seattle, WA, December 7-8, 2006
- *"Phishing, Pharming, & Wholesale Data Harvesting"* University of Dayton School of Law Significant Developments In Computer & Cyberspace Law Convention, Dayton, Ohio, June 9, 2006
- *"Lessons Learned From Katrina, SARS, and Other Disasters"* University of Dayton School of Law Significant Developments In Computer & Cyberspace Law Convention, Dayton, Ohio, June 9, 2006
- "*e-Discovery and the Proposed Federal Rules of Civil Procedure (FRCP) Changes - How Safe Is The Safe Harbo*r?" Cooley Godward LLP, San Diego, California, March 2, 2006
- "*Proposed Changes To Rule 26: A New Game?*", Oregon State Bar, Business Litigation Continuing Legal Education, Portland, Oregon, November 9, 2005
- "*A View from the Witness Stand,*" Computer Related Investigations, Management, and Education (CRIME), Portland, Oregon, September 7, 2005

- "*The Technology of Electronic Discovery*" Tulane Law School, New Orleans, Louisiana, April 20, 2004
- *"Preserving Documents and Data",* Association of Trial Lawyers of America, Case Management and Electronic Discovery in Pharmaceutical Litigation, Dallas, Texas, March 7–8, 2003
- *"Documents, Databases, Discovery and the Damned",* University of Kentucky College of Law 4th Annual Computer & Technology Law Institute, Lexington, Kentucky, November 1-2, 2002
- "*Forensic Software Analysis (electronic discovery)*", Louisiana State Bar Association – Mass Torts Symposium, New Orleans, Louisiana, October 25, 2002
- "*eDiscovery – The Role of an Expert*", Computer Related Investigations, Management, and Education (CRIME), Portland, Oregon, October 8, 2002
- *"Working with Experts"* (panel member), Computer Law Association, Orlando, Florida, October 3, 2002
- "*Efficient Discovery Through the Use of Technology*" Association of Trial Lawyers of America (ABTL), Atlanta, Georgia, July 20-24, 2002
- *"The Technology of Discovery Issues"* University of Dayton School of Law Advanced Computer and Cyberspace Law Convention, Dayton, Ohio, June 7, 2002
- "*Beyond Common Experience - Persuading the Jury with Expert Testimony Mini-Seminar*" panel participant and software expert, Association of Business Trial Lawyers (ABTL), San Diego, California, May 11, 2002
- *"Computer Searches and Seizures: Some Unresolved Issues,"* 8 Mich. Telecomm. Tech. L. Rev. 1 (2002), Susan W. Brenner and Barbara Frederiksen, available at http://www.mttlr.org/voleight/Brenner.html
- *"Information Technology Basics"* Sixth Annual CyberSpace Camp Conference, San Jose, California, February 14-16, 2002
- *"Emerging Issues in CyberSpace: Regulations without Borders and Borders without Regulations"* University of Calgary Faculty of Law, Alberta, Canada, February 6, 2002
- *"Evidence in the Age of Electrons*" Guest Lecturer, Professor Davis's Internet Litigation LLM course, Santa Clara University School of Law, Santa Clara, California, November 17, 2001
- *"Tunnel Blindness: Insecurity and the Internet"* Oregon State Bar Continuing Legal Education Computer Law in the New… new Economy, Portland, Oregon, November 2, 2001

- *"Forensic Software Analysis: Smoking Guns and Spinning Disks Redux"* Louisiana State Bar Class Action/Mass Torts Symposium 2001, New Orleans, Louisiana, October 26, 2001
- "*Beyond Common Experience - Persuading the Jury with Expert Testimony*" panel participant and software expert, Association of Business Trial Lawyers (ABTL), LaQuinta, California, October 12-14, 2001
- "*Tools and Techniques for Forensic Analysis*." 2001 Federal Public Defenders Computer Systems Administrator Conference, San Diego, California, June 12, 2001
- *"Technologies for Data Collection and Snooping."* University of Dayton School of Law Computer and Cyberspace Law Convention, Dayton, Ohio, June 8, 2001
- "*New Technologies and the Legal Issues They Raise*." University of Dayton School of Law Computer and Cyberspace Law Convention, Dayton, Ohio, June 8, 2001
- "*Records Retention, Privacy, and the Age of Electrons*." Financial Women's Association, Silicon Valley Conference, San Francisco, California, March 2001
- "*Managing The Mountain -- Strategies For Computer Based Evidence*." Clifford Chance, In-house conference, London, England, March 2001
- "Managing The Mountain -- Strategies For Computer Based Evidence." The Computer Law Association European CyberSpaceCamp Conference, Amsterdam, the Netherlands, March, 2001
- "What You Need to Know About Domain Names: Introduction and Overview." Domain Name Protection, Litigation & Management Summit, San Francisco, California, February 2001
- "Computer Based Evidence: Strategies To Manage The Mountain" Herman Middleton, New Orleans, January 2001
- ALI-ABA Trial Of A Software Patent Case: Panel participant and software expert presenting video taped testimony for the mock trial. Chicago, Illinois, September 2000
- *"The ABCs of CBE (Computer-Based Evidence)."* Oregon Criminal Defense Lawyers Association, Bend, Oregon, June 2000
- *"New Technologies: New Challenges for the Law"* (Paper co-authored with Andy Johnson-Laird, William R. Trost), Dayton Law Journal, June, 2000
- *"Computers and the Law: Collaboration or Collision?"* (Paper co-authored with Andy Johnson-Laird, William R. Trost), The Second Annual Symposium On Information Technology And Cyberspace Law, May, 2000 (Osgoode Hall Law School of York University, Toronto, Canada)

- "Electronic Evidence (Too Much of A Good Thing?)" Santa Clara County Bar Association, May, 2000 (CLE)
- "Bringing Your Story Home: Technology In The Courtroom" Willamette University College Of Law, May 2000
- *"Computer Based Evidence – The ABCs of CBE"* Willamette University College of Law, April, 2000
- "*Making Sense of Electronic Evidence*" Conference For Federal Defender Administrators And Computer Systems Administrators, April, 2000
- FJC Mini Conference on Discovery of Computerized Information, Hastings College Of Law, March, 2000
- "*Techno-Archeology™ - The Analysis of Failed Software Development*" Lane Powell Spears Lubersky, November, 1999 (CLE)
- *"Y2K Incoming! – Preserving Evidence For The Inevitable"* Oregon State Bar, Computer Law Section, November, 1999 (CLE)
- *"The Preservation and Analysis of Computer-based Evidence,"* Powell, Goldstein, Frazer & Murphy, August, 1999 (CLE)
- *"Forensic Software Analysis: Preservation Discovery and Analysis of Computer-based Evidence,"* Computer Related Investigations, Management, and Education (CRIME), April 13, 1999
- *"Forensic Software Analysis: The Preservation and Analysis of Computer-based Evidence,"* Miller, Nash, Wiener, Hager & Carlsen, February, 1999
- "*A Silent Chorus – The Relevance of Electronic Evidence,*" Willamette University College of Law, Internet Law Caucus, November 1998

Expert Testimony

Court Appointed Expert

1. Court Data System Advisor to the Honorable Marvin J. Garbis, in the U.S. District Court for the District of Maryland, in the matter of Vaughn G., et al. v. Walter G. Amprey, et al., Civil Action No. MJG-84-1911.
2. Neutral expert for the Court on issues relating to data search and recovery in the U.S. District Court for the District of Oregon in the matter of Solar Nation, Inc. v. Solar Jones, Inc., et al., Case No. 3:12-CV-01199-BR

Trial Testimony

1. Admitted as an expert in computer science, computer technology, forensic examination, and source code in the U.S. District Court for the District of Nevada, *Oracle International Corporation v. Rimini Street, Inc.*; Case No. 2:14-cv-1699-MMD-DJA November 2022 (Engaged by plaintiff)
2. Admitted as an expert in computer and software forensics in the U.S. District Court for the Western District of Texas Austin Division, *UMG Recordings, Inc., et al v. Grande Communications Networks LLC and Patriot Media Consulting, LLC*; Case No. 1:18-mc-00613-LY October 2022 (Engaged by plaintiffs)
3. Admitted as a technical expert in the US District Court, District of Nevada, *Oracle USA, Inc., et al v. Rimini Street Inc*; Case No. 2:10-cv-0106-LRH-VCF September 2021 (Engaged by plaintiff – bench trial offer to show cause)
4. Admitted as an expert in computer programming, software development and forensics analysis in computer and software in the US District Court for the Northern District of Illinois Eastern Division, *Motorola Solutions, Inc., et al. v. Hytera Communications Corporation Ltd. et al.*; Case No. 1:17-cv-01973 (Engaged by defendants)
5. Admitted as an expert in the analysis of computer software and computer-generated data in the US District Court for the Eastern District of Virginia, *Sony Music Entertainment, et al. v. Cox Communications, Inc., et al.;* Case No. 1:18-cv-00950-LO-JFA; December 2019 (Engaged by plaintiffs)
6. Admitted as an expert in forensic software analysis, software design, and reverse engineering in the US District Court for the Eastern District of New York, *Point 4 Data Corporation and Dynamic Concepts Inc. v. Tri-State Surgical Supply & Equipment Ltd., SJ Computers, Inc. and Shmuel Judkovitz*; Case No. 11-cv-0726 (RJD); August 2018 (Engaged by plaintiffs for software analysis).
7. Admitted as an expert in the areas of computer forensics and source code analysis in the US District Court for the Northern District of Texas Dallas Division, *Zenimax Media Inc. and ID Software LLC v. Oculus VR, LLC, Palmer Luckey, and Facebook, Inc.,* Case No. 3:14-cv-1849-K; January 2017 (Engaged by Oculus (defendant) for software analysis in the context of a copyright suit).
8. Admitted as an expert in the areas of forensic software analysis and software design, development and programming in the US District Court for the District of Puerto Rico, *Puerto Rico Treasury Department v. OPG Technology Corp., et al.,* Case No. 3:15-cv-03125 (JAG) August 2016 (Engaged by OPG Technology Corp (defendant) for software analysis in the context of a copyright suit).

9. Admitted as an expert in computer programming and computer forensics in the US District Court for the Eastern District of Virginia, *BMG Rights Management (US) LLC, and Round Hill Music LP v. Cox Enterprises, Inc., Cox Communications, Inc., Coxcom, LLC*, Case No. 1:14-cv-1611 (LOG/JFA) December 2015 (Engaged by BMG Rights Management (plaintiff) for source code related analysis in the context of a copyright suit.)
10. Admitted as an expert in software investigation in the US District Court for the Northern District of California San Francisco Division, *Fujifilm Corporation v. Motorola Mobility LLC*, Case No. C12-03587 RS; April 2015 (Engaged by Fujifilm (plaintiff) Corporation for source code analysis related to accused software in the context of a patent infringement suit)
11. Admitted as an expert in computer science, source code, and software development in the US District Court for the District of Delaware, *Finjan, Inc v. Symantec Corp., Webroot Software, Inc. Websense, Inc. and Sophos, Inc.,* Civil Action No. 10-593-GMS; December 2013. (Engaged by Websense, Inc. for source code analysis related to accused software in the context of a patent infringement suit.)
12. Admitted as an expert to provide testimony about video data in the District Court of Bexar County, Texas, 407th Judicial District, *Karen D. Griffin, individually and Virginia L. Brunner, as next of friend of Karen D. Griffin v. Union Pacific Railroad Company, Kenneth Piper and Gary Anderson*, Cause No. 2010-CI08523; March 2012 (Engaged by the plaintiff, discovery issues and analysis relating to analysis of electronic Track Image Recorder Video files.)
13. Admitted as an expert in computer software in the US District Court for the Eastern District of Virginia, Norfolk Division**,** *ActiveVideo Networks, Inc. v. Verizon Communications, Inc. Verizon Services Corp., Verizon Virginia, Inc. and Verizon South, Inc.***,** Civil Action No. 2:10-cv-248; July 2011. (Engaged by ActiveVideo Networks for source code analysis related to accused devices in the context of a patent infringement suit.)
14. Admitted as an expert in software engineering in the U.S. District Court for the Eastern District of Texas, Tyler Division, *Clear With Computers, LLC. v. Hyundai Motor America, Inc.*, Case No. 6:09-cv-479 LED; June 2011. (Engaged by Hyundai Motor America, Inc. for invalidity analysis in the context of a patent infringement suit.)
15. Admitted as an expert in computer based evidence in *The People of the State of California v. Jason Cai,* Superior Court of the State of California, for the County of Santa Clara, Case No. CC810427; July 2010. (Engaged by counsel for defendant in a homicide matter)
16. *Bill Fraser, Soo Min Fay, Doug Frosch, George Marshall, Cal Mitchell, Jim Rubino, Tim Shea, John Sullivan, and Steve Munson v. Valley Energy*

Investment Fund U.S., L.P., Vulcan Investment Holdings, LLC, Denham Commodity Partners Fund V LP, Denham Capital Management L.P., Merrill Lynch Commodity Partners, LLC, Scott Mackin, David Owens, Rod Wimer, Robert Warburton, Todd Bright, Robert Jones, and Vulcan Power Company, Circuit Court for the State of Oregon, Lane County, Case No. 160826841; June 2010. (Engaged by Plaintiffs to assess whether discovery costs incurred by Defendants were reasonable in the context of case fact pattern.)

17. Admitted as expert in evidentiary hearing In the Circuit Court of the 11th Judicial Circuit, In and For Miami-Dade County, Florida, General Jurisdiction Division, *Jarrell Cannon a minor by and through his mother and natural guardian, Alicia Lott, and Alicia Lott, individually v. Ford Motor Company, and Hazel Edgecomb*, Case No. 05-21648 CA20; May 2009 (Engaged by plaintiffs in the context of technical issues in discovery)
18. Admitted as an expert in the District Court of Tarrant County, Texas, discovery hearing, *Estate of Dwayne Freeto, et al. v. Ford Motor Company and Scott Hilburn*, Case No. 348-233429-08; March 2010. (Engaged by the Estate of Dwayne Freeto, et al., discovery issues and analysis relating to electronic data.)
19. *CollegeNet, Inc. v. XAP Corporation*, U.S. District Court for the District of Oregon, Case No. 03-1229-BR; June 2008 (Engaged by XAP Corporation, analysis of inequitable conduct during patent prosecution.)
20. Admitted as an expert on software analysis in *Grantley Patent Holdings, Ltd. v. Clear Channel Communications, Inc., et al.*, Case No. 9:06cv259; April, 2008 (Engaged by Grantley Patent Holdings, Ltd., patent infringement/validity.)
21. Markman hearing in *Grantley Patent Holdings, Ltd. v. Clear Channel Communications, Inc., et al.*, Case No. 9:06cv259; October 2007 (Engaged by Grantley Patent Holdings, Ltd.)
22. Admitted as a software expert in *Ricoh Corporation and Ricoh Company, Ltd. v. Pitney Bowes, Inc.*, Case No. 02-5639 (GEB); November 2006 (Engaged by Pitney Bowes Inc., patent infringement/validity.)
23. Admitted as an expert on software analysis *CollegeNet, Inc. v. XAP Corporation*, U.S. District Court for the District of Oregon, Case No. 03-1229-BR; September 2006 (Engaged by XAP Corporation, patent infringement/validity.)
24. Admitted as an expert on computer software development, clean room procedures, and database in *HotSamba, Inc. v. Caterpillar, Inc.*, U.S. District Court Northern District of Illinois Eastern Division, Case No. 01-C-5540, September 2006 (Engaged by Caterpillar Inc., copyright/licensing dispute/breach of contract.)

25. Admitted as an expert on software development and the recover and analysis of computer based evidence in *Compuware Corporation v. International Business Machines Corp.*, United States District Court for the Eastern District of Michigan, Case No. 02-70906, March, 2005 (Engaged by Compuware Corporation to perform analysis of computer based evidence relating to copyright/trade secret issues.)
26. Admitted as an expert on the analysis of computer based evidence in *Norman B. Feaster et al. v. CSX Transportation, Inc.*, Franklin County Circuit Court Case No. 10,913-CV, November 2002 (Engaged by Norman B. Feaster, et al, railroad case involving analysis of locomotive event recorder data.)
27. Admitted as an expert on recovery and analysis of computer based evidence in *Bridgestone/Firestone, Inc., ATX, ATX II, and Wilderness Tires, Products Liability Litigation*, United States District Court Southern District of Indiana Indianapolis Division Court Case No. IP00-9373-C-B/S MDL No. 1373, February 2002 (Engaged by Plaintiffs' Litigation Committee, discovery issues and analysis relating to electronic data.)
28. Admitted as an expert on computer software and the analysis of computer based evidence in *United States of America v. Santee Sioux Tribe of Nebraska,* United States District Court for the District of Nebraska, Case No. 8:96CV367, October, 2001 (Engaged by Santee Sioux Tribe of Nebraska, analysis relating to the software used for operation of computer controlled gaming devices.)
29. Admitted as an expert on recovery and analysis of computer based evidence in *Tim O'Neil v. Levi Strauss and Company et al,* Superior Court of California, Case No. 221466, February, 2001 (Engaged by Levi Strauss and Company, recover and analyze computer based evidence.)
30. Admitted as an expert on recovery and analysis of computer based evidence in *State of California v. Bahram Saghari,* Superior Court of California, Case No. 205525, February, 2000. (Engaged by Bahram Saghari, recover and analyze computer source code and computer based evidence)
31. Admitted as an expert on computer software development in *Novinger v. TRW et al.*, U.S. District Court for the District of Oregon, Case No. CV96-286-JE, July, 1998. (Engaged by Novinger, to review software and data management practices relating to an identity theft case)

Other Court (State and Federal) Testimony

1. Hearing in the US District Court Middle District of Florida Tampa Division; *UMG Recordings, Inc., et al v. Bright House Networks, LLC*, Case No. 8:19-cv-710-MSS-TGW; May 25, 2022

Arbitration Testimony

1. Judicial Arbitration and Mediation Services, Inc. (JAMS), *Chrome Systems, Inc. v. Autodata Solutions, Inc., et al*. (Case No. 11808-VCG), JAMS Reference No. 1340012931; September 2016 (Engaged by Autodata Solutions (defendant) for copyright dispute)
2. *In the Matter of the Companies' Creditors Arrangement Act, R.S.C. 1985, c.C.36, as Amended And in the Matter of a Plan or Arrangement of Nortel Networks Corporation, Nortel Networks Limited, Nortel Networks Global Corporation and Nortel Networks Technology Corporation*, (discovery hearing ordered by) Ontario Superior Court of Justice, Court File No. 09-CL-7950 (Engaged by SNMP Research International and SNMP Research, Inc. for analysis of technical materials and discovery issues)
3. Judicial Arbitration and Mediation Services, Inc. (JAMS), *The Clearing Corporation v. The Chicago Merchantile Exchange, Inc.*, Case No. 06CH10553, April 2008 (Engaged by The Clearing Corporation relating to breach of license/copyright dispute.)
4. Judicial Arbitration and Mediation Services, Inc. (JAMS), *Polimaster Ltd and NA&SE Trading Co., Limited and RAE Systems, Inc.*, Case No. 1110009296, March 2007 (Engaged by RAE Systems, Inc. to analyze software relating to copyright, trade secret, and reverse engineering allegations.)
5. International Commercial Arbitration Act, *MPI Technologies, Inc., and Xerox Canada, Ltd and Xerox Corporation*, January 2005 (Engaged by MPI Technologies to analyze computer software and evidence relating to a breach of license/copyright dispute.)
6. American Arbitration Association, *Bionic Buffalo Corporation v. Integrated Systems, Inc. and WindRiver Systems, Inc.*, Case No. 79 117 0011299, February 2002. (Engaged by Integrated Systems, Inc. to analyze computer software and evidence relating to a breach of contract/copyright dispute.)
7. American Arbitration Association, *Rollins, Inc., v. ALE Systems,* Case No. AAA30 181 00081 98, June, 1999 and August 1999. (Engaged by Rollins, Inc., to analyze computer software and evidence relating to a breach of contract/failed software development dispute.)

Deposition Testimony

1. US District Court Northern District of California San Francisco Division; *Richard Kadrey, et al v. Meta Platforms, Inc.*; Case No. 3:23-cv-03417-VC; March 2025

2. US Bankruptcy Court Southern District of New York; *In re Frontier Communications Corporation, et al.*; Case No. 20-22476 (MG); January 2025
3. US District Court Northern District of California; *Scientific Applications & Research Associates (SARA), Inc. v. Zipline International, Inc.*; Case No. 3:22-cv-04480-JSC; November 2024
4. US District Court District of Connecticut; *Post University, Inc. v. Course Hero, Inc.*; Case No. 3:21-cv-01242; May 2024
5. US District Court for the District of Delaware; *Design With Friends, Inc. and Design With Friends Ltd. v. Target Corporation*; Case No. 1:21:-cv-01376-SB; January 2024
6. US District Court for the District of Delaware; *Thomson Reuters Enterprise Centre GMBH and West Publishing Corporation v. Ross Intelligence, Inc.*; Case No. 20-613-LPS; November 2022
7. US District Court for the Southern District of Florida Miami Division; *Athos Overseas, Ltd. v. YouTube, Inc., YouTube, LLC, and Google, LLC;* Case No. 1:21-cv-21698-DPG; October 2022
8. US District Court for the Southern District of California; *MedImpact Healthcare Systems, Inc., et al v. IQVIA Inc., et al*; Case No. 3:19-cv-01865-GPC-LL; February 2022
9. US District Court for the Western District of Texas, Austin Division; *UMG Recordings, Inc., et al v. Grande Communications Networks LLC and Patriot Media Consulting, LLC*; Case No. 1:17-CV-365; December 2021
10. US District Court Middle District of Florida, Tampa Division; *UMG Recordings, Inc., et al v. Bright House Networks, LLC*; Case No. 8:19-cv-710-MSS-TGW; November 2021
11. US District Court for the District of Colorado; *Warner Records Inc., et al. v. Charter Communications, Inc.*; Case No. 19-cv-00874-RBJ-MEH; October 2021
12. US District Court for the Western District of Texas Austin Division; *Via Vadis, LLC and AC Technologies, S.A. v. Blizzard Entertainment, Inc.*; Case No. 1:14-cv-810-LY; July 2021
13. US District Court Southern District of New York; In Re Keurig Green Mountain Single Serve Coffee Antitrust Litigation *JBR, Inc. (dba Rogers Family Company) v. Keurig Green Mountain, Inc. (fka Green Mountain Coffee Roasters, Inc., and as successor to Keurig, Inc.)*; ECF case 1:14-md-2542-VSB-HBP (MDL No. 2542); March 2021
14. Superior Court of the State of California County of San Francisco; *Qorum, Inc. v. QAProsoft, LLC; Solvd, Inc., Igor Lysenko, Igor Vayner, and Does 1 through 50, inclusive*; Case No. CGC-19-577985; January 2021

15. US District Court for the Eastern District of Michigan Southern Division; *Bruce Zak v. Facebook, Inc.*; Case No. 4:15-cv-13437-TGB-MJH; December 2020
16. US District Court for the District of Nevada; *Oracle USA Inc., Oracle America, Inc., and Oracle International Corporation v. Rimini Street, Inc., and Seth Ravin*; Case No. 2:10-cv-0106 LRH-VCF; June 2020
17. American Arbitration Association; *Press Ganey Associates, Inc. v. Qualtrics, Inc.*; Case No. 01-18-0004-4674; October 2019
18. US District Court for the Northern District of Illinois, Eastern Division; *Motorola Solutions, Inc., et al v. Hytera Communications Corporation Ltd., et al*; Case No. 1:17-CV-01973; September 2019
19. US District Court for the Eastern District of Virginia; *Sony Music Entertainment, et al v. Cox Communications Inc. and CoxCom LLC*; Case No. 1:18-cv-00950-LO-JFA; June 2019
20. US District Court for the Western District of Texas, Austin Division; *UMG Recordings, Inc., et al. v. Grande Communications Networks LLC and Patriot Media Consulting, LLC*; Case No. 1:17-cv-00365; October 2018
21. US District Court District of Nevada, *Rimini Street, Inc. v. Oracle International Corporation; Oracle America Inc., Oracle International Corporation v. Rimini Street, Inc., Seth Ravin*; Case No. 2:14-cv-01699-LDG-VCF; September 2018
22. US District Court Northern District of California, *Foresee Results, Inc., Answers Corporation v. Auryc, Inc., Auryc LLC, Jinlin Wang, Feng Shao, Amod Setlur and Does 1 through 20*; Case No. 3:17-cv-06973-RS; September 2018
23. U.S. District Court Southern District of New York, *RELX, Inc. v. Informatica Corp*, Case No. 1:16-cv-9718-AKH; June 2018
24. In the Circuit Court of the 17th Judicial Circuit in and for Broward County, Florida, Complex Business Division, *Flexible Business Systems, Inc. v. Seacor Island Lines LLC and Seacor Holdings Inc.*; Case No. 15-006350 CACE (07); February 2018
25. US Bankruptcy Court for the District of Delaware, *In re Nortel Networks, Inc.*, Bankr Case No. 09-10138(KG); *SNMP Research International, Inc., and SNMP Research, Inc. vs. Nortel Networks, Inc., et al. and Avaya, Inc.*; Case Adv Proc. No. 11-53454(KG); February 2017
26. US District Court for the District of Delaware, *Avaya, Inc. v. SNMP Research Inc.*, Case No. 12-191-RGA; January 2016
27. US District Court for the Southern District of California, *Anthony Johnson v. Storix, Inc.*, Case No. 14-CV-1873-H-BLM; October 2015
28. US District Court for the Eastern District of Virginia, *BMG Rights Management(US) LLC, and Round Hill Music LP v. Cox Enterprises, Inc., Cox*

Communications, Inc., CoxCom, LLC, Case No. 1:14-cv-1611(LOG/JFA); August 2015

29. US District Court for the Northern District of California San Francisco Division, *Fujifilm Corporation v. Motorola Mobility LLC*, Case No. C12-03587 RS; November 2014
30. US District Court for the Eastern District of New York; *Point 4 Data Corporation and Dynamic Concepts, Inc. v. Tri-State Surgical Supply & Equipment, Ltd., SJ Computers, Inc., and Shmuel Judkovitz*, Case No. 11 CV 0726 (RJD); June 2012
31. US District Court for the District of Delaware; Finjan, Inc. v. McAfee, Inc., Symantec Corp., Webroot Software, Inc., Websense Inc., and Sophos, Inc., Case No. 10-593-GMS; June 2012 (Engaged by defendant Websense Inc.; patent infringement)
32. US District Court for the Eastern District of Louisiana; *Sean Bowie v. The New Orleans Public Belt Railroad Commission, d/b/a New Orleans Public Belt Railroad Company*, Case No. 11-00755; June 2012
33. US District Court for the Central District of California, Southern Division; *Bryan Pringle v. William Adams, Jr., et al.*, Case No. SACV10-1656 JST (RZx); January 2012 (Engaged by plaintiff to address issues related to spoliation and copyright infringement allegations)
34. In the District Court of Bexar County, Texas, 407th Judicial District; *Karen Griffin v. Union Pacific Railroad Company*, et al., Cause No. 2010-CI08523; December 2011 (Engaged by plaintiffs in the context of a railroad case requiring analysis of TIR (Track Image Recorder) video)
35. US District Court for the Western District of Pennsylvania, *University of Pittsburgh of the Commonwealth System of Higher Education dba University of Pittsburgh v. Varian Medical Systems, Inc.*; Case No. 2:08-cv-01307, September 2011 (Engaged by University of Pittsburgh; patent infringement)
36. US District Court for the Eastern District of Virginia, Norfolk Division, *ActiveVideo Networks, Inc. v. Verizon Communications, Inc., Verizon Services Corp., Verizon Virginia, Inc., and Verizon South Inc.*; Case No. 2:10-cv-248-RAJ-FBS, June 2011 (Engaged by ActiveVideo Networks, Inc. ; patent infringement)
37. U.S. District Court for the Eastern District of Texas, Tyler Division, *Clear With Computers, LLC. v. Hyundai Motor America, Inc.*, Case No. 6:09-cv-479 LED, April 2011 (Engaged by Hyundai Motor America, Inc.; patent infringement suit.)
38. In the Circuit Court of the 11th Judicial Circuit, In and For Miami-Dade County, Florida, General Jurisdiction Division, *Jarrell Cannon a minor by and through*

his mother and natural guardian, Alicia Lott, and Alicia Lott, individually v. Ford Motor Company, and Hazel Edgecomb, Case No. 05-21648 CA20, March 2011 (Engaged by plaintiffs in the context of technical issues in discovery)

39. U.S. District Court for the Eastern District of Texas, Tyler Division, *Clear With Computers, LLC. v. Hyundai Motor America, Inc.*, Case No. 6:09-cv-479 LED, March 2011 (Engaged by Hyundai Motor America, Inc. patent infringement suit.)
40. In the Circuit Court of Cook County, Illinois, County Department-Chancery Division, *Citadel Investment Group, v. Teza Technologies, LLC, et al.*, Case No. 09 CH 22478, July 2010. (Engaged by Teza Technologies to verify effectiveness of clean room protocol.)
41. U.S. District Court for the District of Oregon, *CollegeNet, Inc. v. XAP Corporation*, Case No. 03-1229-BR, April 2008. (Engaged by XAP Corporation, to analyze computer software in the context of a patent infringement suit.)
42. U.S. District Court for the Western District of Wisconsin, *Extreme Networks, Inc. v. Enterasys, Inc.*, Case No. 07-C-0229-C, February 2008. (Engaged by Enterasys, Inc., patent infringement.)
43. U.S. District Court for the Eastern District of Texas, Lufkin Division, *Grantley Patent Holdings, Ltd. v. Clear Channel Communications, Inc.*, et al; Case No. 9:06cv259, February 2008 (Engaged by Grantley Patent Holdings, Ltd., patent infringement.)
44. U.S. District Court for the Western District of Wisconsin, *Extreme Networks, Inc. v. Enterasys, Inc.*, Case No. 07-C-0229-C, January 2008. (Engaged by Enterasys, Inc., patent infringement.)
45. U.S. District Court Northern District of California San Jose Division, *Creative Science Systems, Inc. v. Forex Capital Markets LLC and REFCO Group Ltd., LLC*, Case No. C04-03746 JF (RS), September 2006. (Engaged by Forex Capital Markets to perform analysis in the context of a software licensing dispute.)
46. U.S. District Court Northern District of Minnesota, *Ricoh Corporation and Ricoh Company, Ltd. v. Pitney Bowes, Inc.*, Case No. 02-5639 (GEB), August 2006. (Engaged by Pitney Bowes Inc., patent infringement.)
47. U.S. District Court Northern District of Illinois Eastern Division, *HotSamba, Inc. v. Caterpillar, Inc.*, Case No. 01-C-5540, July 2006. (Engaged by Caterpillar Inc.)
48. U.S. District Court for the District of Oregon, *CollegeNet, Inc. v. XAP Corporation*, Case No. 03-1229-BR, March 2006. (Engaged by XAP Corporation, to analyze computer software in the context of a patent infringement suit.)
49. U.S. District Court Northern District of California San Jose Division, *Creative Science Systems, Inc. v. Forex Capital Markets LLC and REFCO Group Ltd., LLC*,

Case No. C04-03746 JF (RS), March 2006. (Engaged by Forex Capital Markets to perform analysis in the context of a software licensing/copyright dispute.)

50. U.S. District Court Central District of California Western Division, *Imax Corporation and Three-Dimensional Media Group, Ltd. V. In-Three, Inc.*, Case No. CV-05-1795 (Mcx), August 2005. (Engaged by In-Three, Inc., to perform analysis of computer software relating to patent validity and prior art.)
51. Superior Court of the State of California, County of San Diego, *Del Mar Datatrac, Inc. v. ProLender Solutions, Inc., et al.,* Case No. GIC 817717, June 2004 (Engaged by Del Mar Datatrac, to analyze computer software in the context of a trade secret/copyright case and oversight of subsequent software production to verify effectiveness of clean room procedures used during remediation.)
52. U.S. District Court Northern District of California Oakland Division, *Compuware Corporation v. International Business Machines*, Case No. 02-70906, May 2003, June 2003, June 2004, and January 2005. (Engaged by Compuware Corporation to perform analysis of computer software and software development efforts in the context of a copyright/trade secret dispute.)
53. U.S. District Court Northern District of California Oakland Division, *VMware, Inc. v. Connectix Corporation and Microsoft Corporation*, Case C03 00654 CW, April 2003. (Engaged by Connectix Corporation, to perform analysis of computer software and potential prior art in the context of a patent dispute.)
54. U.S. District Court for the Eastern District of Virginia, Alexandria Division, *Washington Post. Newsweek Interactive Company, LLC., et al v. The Gator Corporation*, Case No. 02-909-A, December 2002. (Engaged by The Gator Corporation for analysis of computer software and computer-based evidence relating to a dispute involving pop-up advertisements.)
55. Franklin County Circuit Court, *Norman B. Feaster et al. v. CSX Transportation, Inc., et al.*, Franklin County Circuit Court Case No. 10,913-CV, November 2002. (Engaged by Norman B. Feaster, et al. in the context of a railroad case requiring analysis of locomotive event recorder data.)
56. The Superior Court Of The State Of California, *Tim O'Neil v. Levi Strauss and Company, Earnest "Hap" Wheale, Katy Basile, Ruth Meyler, and DOES 1 through 100*, Case No. 305531, January 2001. (Engaged by Levi Strauss and Company, recover and analyze computer based evidence.)
57. U.S. District Court for the Northern District of Illinois, Eastern Division, *Chris-Craft Industrial Products, Inc. v. Kuraray Company, Ltd., Kuraray America, Inc. Cast Film Technology, Inc. and James R. Rossman*, Case No. 98 CV 7298. (Engaged by Chris-Craft to recover and analyze data related to trade secret misappropriation.)

58. U.S. District Court for the District of Oregon, *Novinger v. TRW,* Case No. CV96-286-JE. (Engaged by Novinger, to analyze computer software and data management practices relating to an identity theft case.)